US009193166B1

(12) **United States Patent**
Yabuki

(10) **Patent No.: US 9,193,166 B1**
(45) **Date of Patent: Nov. 24, 2015**

(54) **CARTRIDGE ACCOMMODATING APPARATUS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/730,612**

(22) Filed: **Jun. 4, 2015**

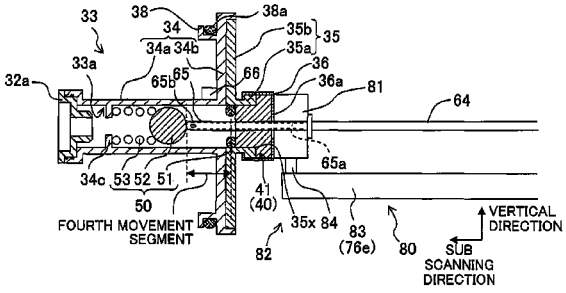
(30) **Foreign Application Priority Data**

Jun. 4, 2014 (JP) 2014-115601

(51) **Int. Cl.**
B41J 29/393 (2006.01)
B41J 2/175 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/1752*** (2013.01); ***B41J 2/17543*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 29/393; B41J 2/17546; B41J 2/0458; B41J 2/0451; B41J 2/2135
USPC 347/19, 84–87
See application file for complete search history.



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(57) **ABSTRACT**

A cartridge accommodating apparatus includes: a cartridge accommodating section accommodating a cartridge which includes a liquid accommodating section, a liquid lead-out channel, a first blocking member blocking a first portion of the liquid lead-out channel, and a second blocking member blocking a second portion between the first portion and the liquid accommodating section; a hollow tube introducing liquid in the liquid lead-out channel into inside of the hollow tube; a moving mechanism moving the hollow tube between a first position at which a tip portion of the hollow tube is located outside the liquid lead-out channel and a second position at which the tip portion of the hollow tube has entered inside the liquid lead-out channel; a driving source; a driving force transmitting mechanism transmitting driving force of the driving source to the moving mechanism; and a driving source controller controlling driving speed of the driving source.

12 Claims, 12 Drawing Sheets

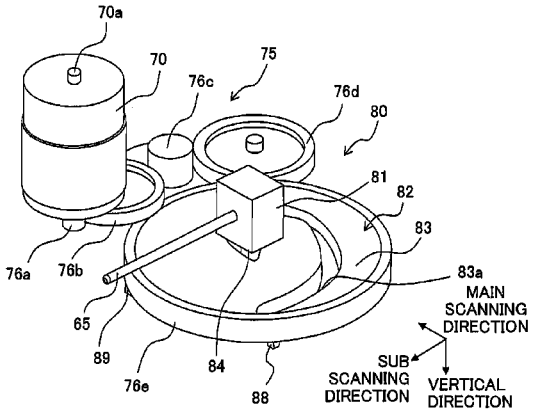


Fig. 1

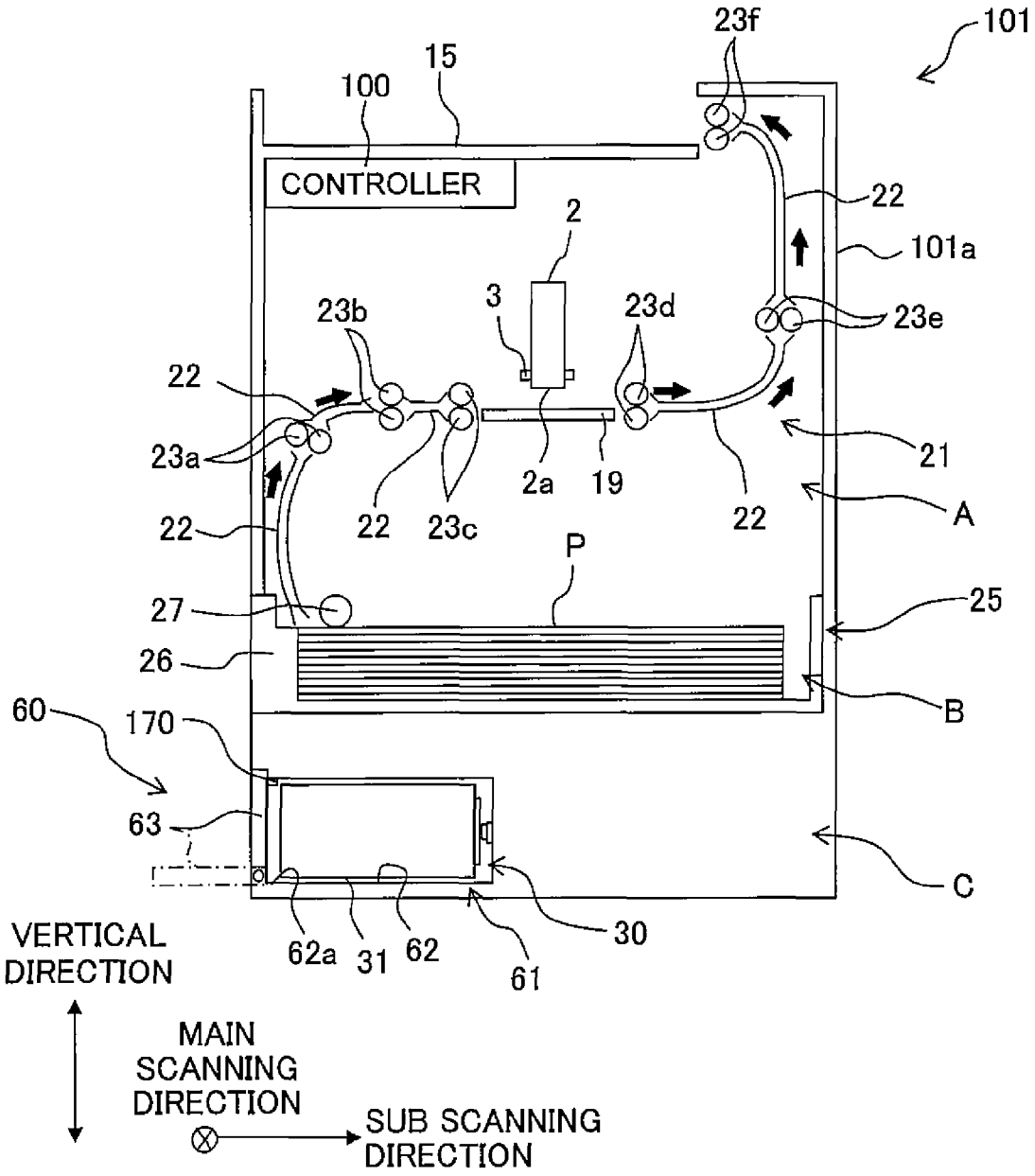

101
23f
15
100
CONTROLLER
22
101a
2
3
23b
23d
23e
22
23a
21
2a
19
22
22
23c
22
A
P
27
25
26
B
60
170
63
C
62a
31
62
61
30
VERTICAL DIRECTION
MAIN SCANNING DIRECTION
SUB SCANNING DIRECTION

Fig. 2A

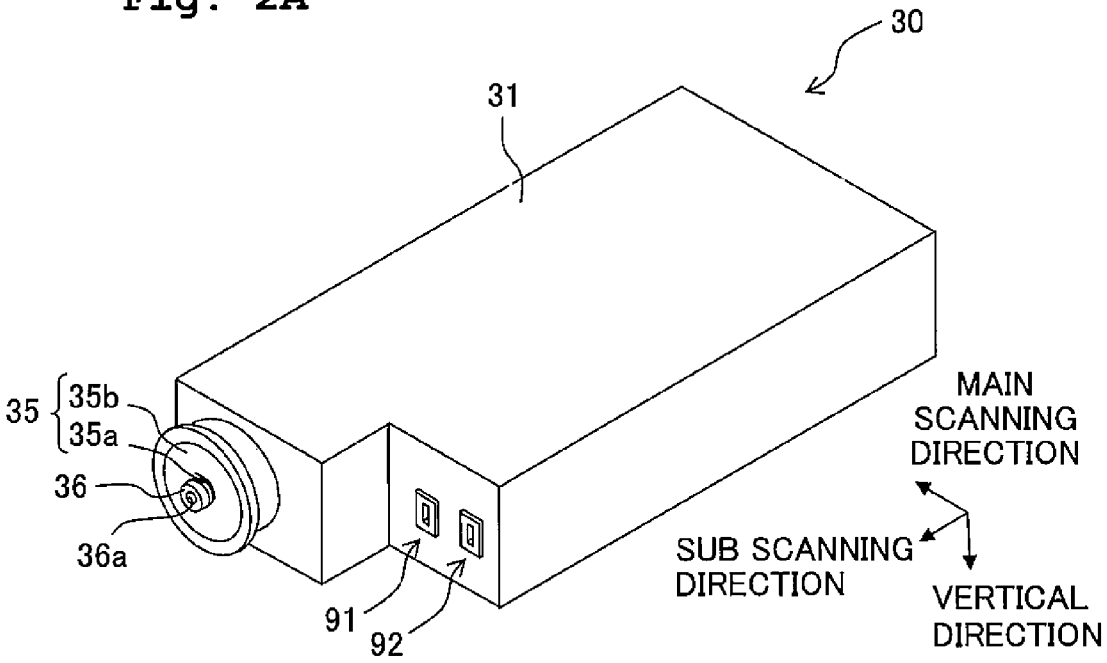

30
31
35
35b
35a
36
36a
91
92
MAIN SCANNING DIRECTION
SUB SCANNING DIRECTION
VERTICAL DIRECTION

Fig. 2B

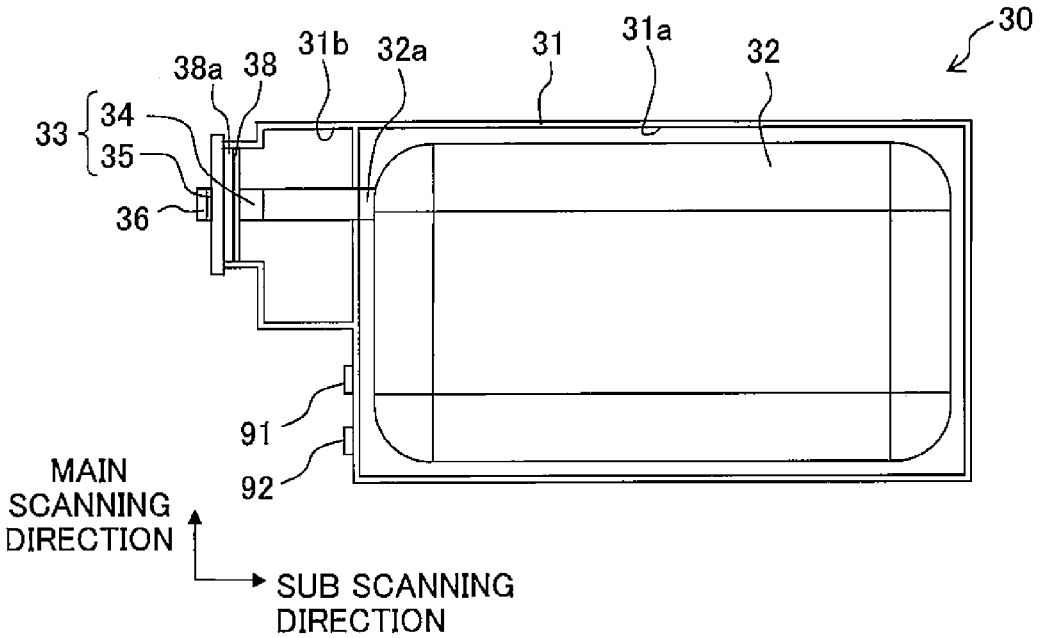

30
31b
32a
31
31a
32
38a
38
33
34
35
36
91
92
MAIN SCANNING DIRECTION
SUB SCANNING DIRECTION

Fig. 3A

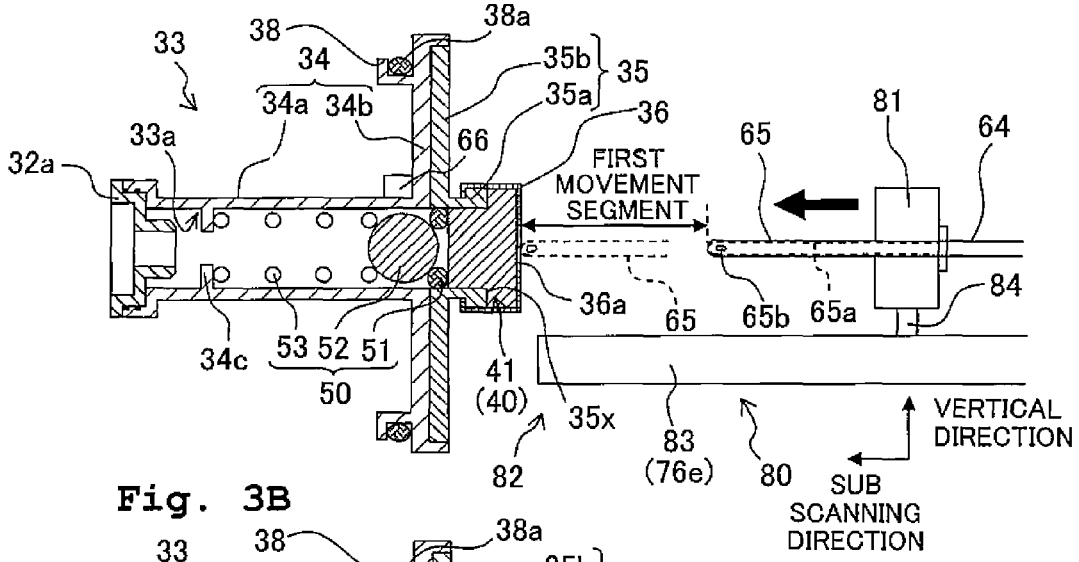


Fig. 3B

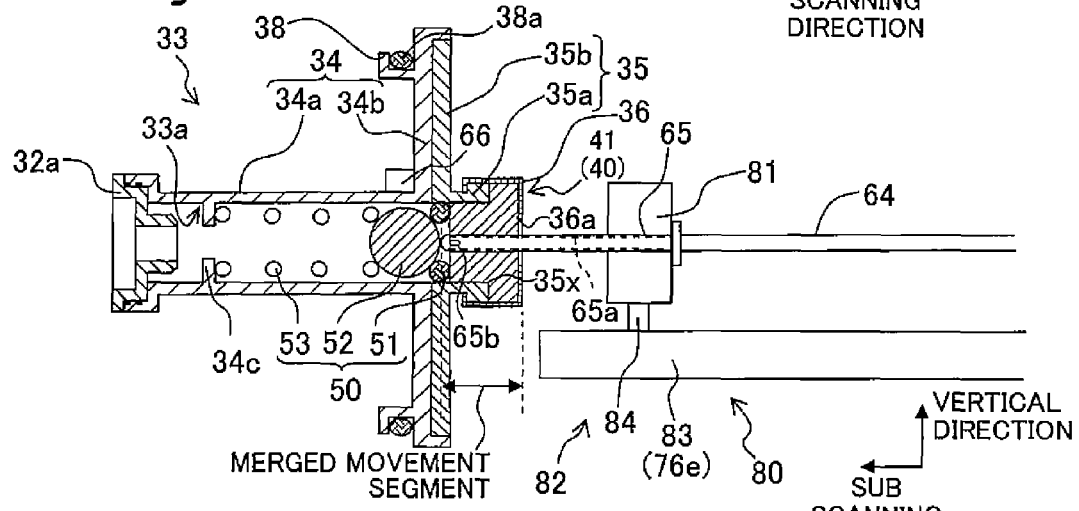


Fig. 3C

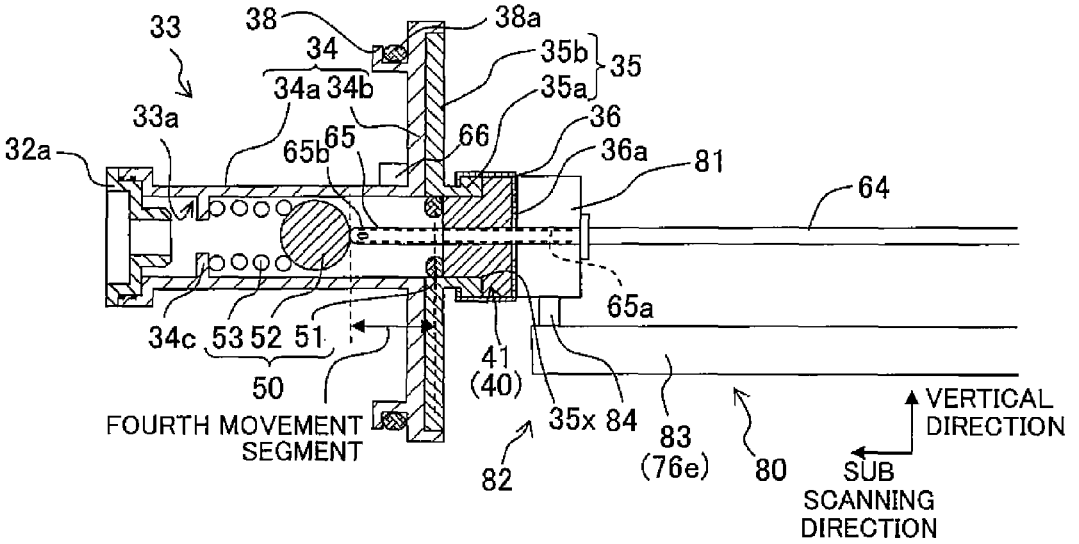


Fig. 4A

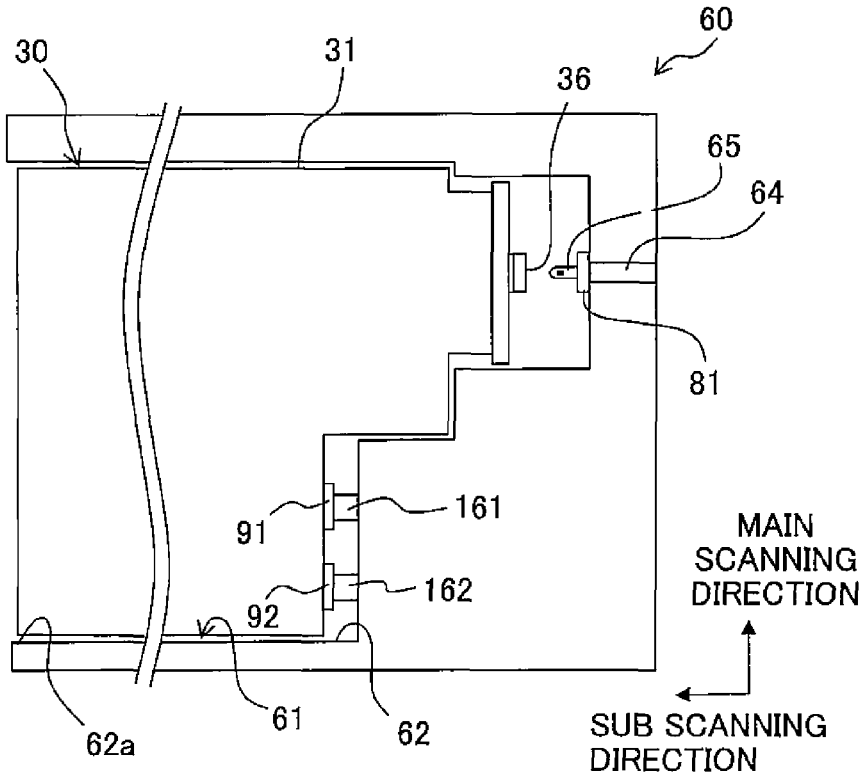

60
30
31
36
65
64
81
91
161
162
92
MAIN SCANNING DIRECTION
SUB SCANNING DIRECTION
62a
61
62

Fig. 4B

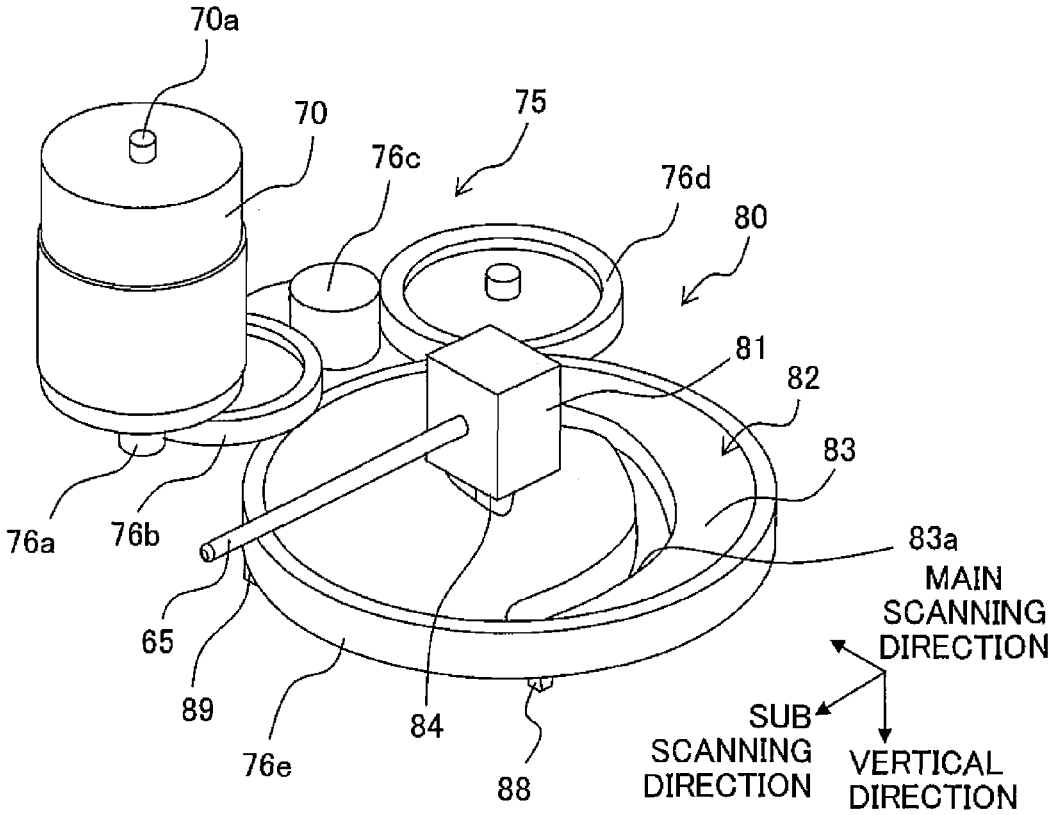

70a
70
75
76c
76d
80
81
82
83
83a
76a
76b
65
89
76e
84
88
MAIN SCANNING DIRECTION
SUB SCANNING DIRECTION
VERTICAL DIRECTION

Fig. 5A

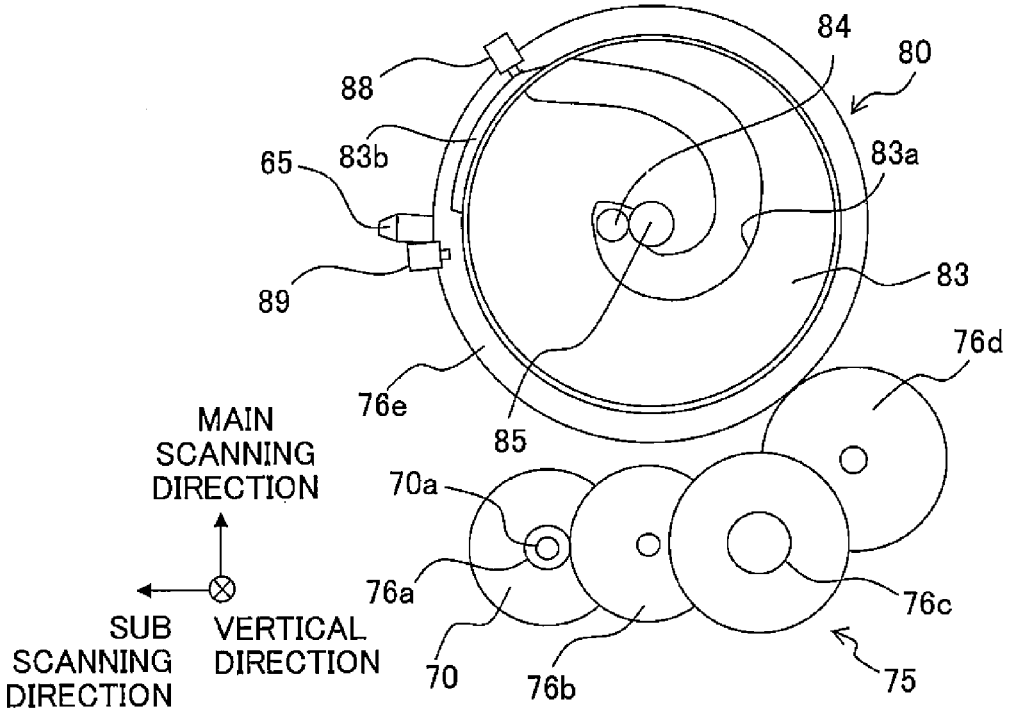
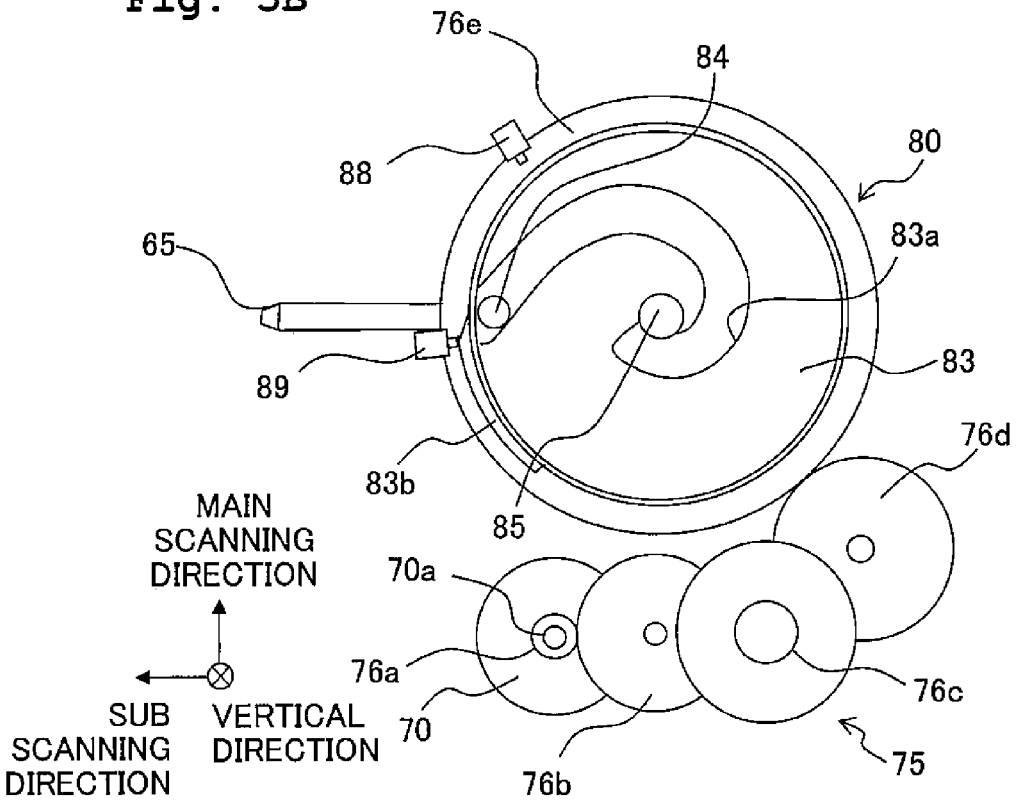

84
80
88
65
83b
83a
89
83
76d
76e
85
MAIN SCANNING DIRECTION
70a
76a
76c
SUB SCANNING DIRECTION
VERTICAL DIRECTION
70
76b
75

Fig. 5B


76e
84
88
80
65
83a
89
83
76d
83b
85
MAIN SCANNING DIRECTION
70a
76a
76c
SUB SCANNING DIRECTION
VERTICAL DIRECTION
70
76b
75

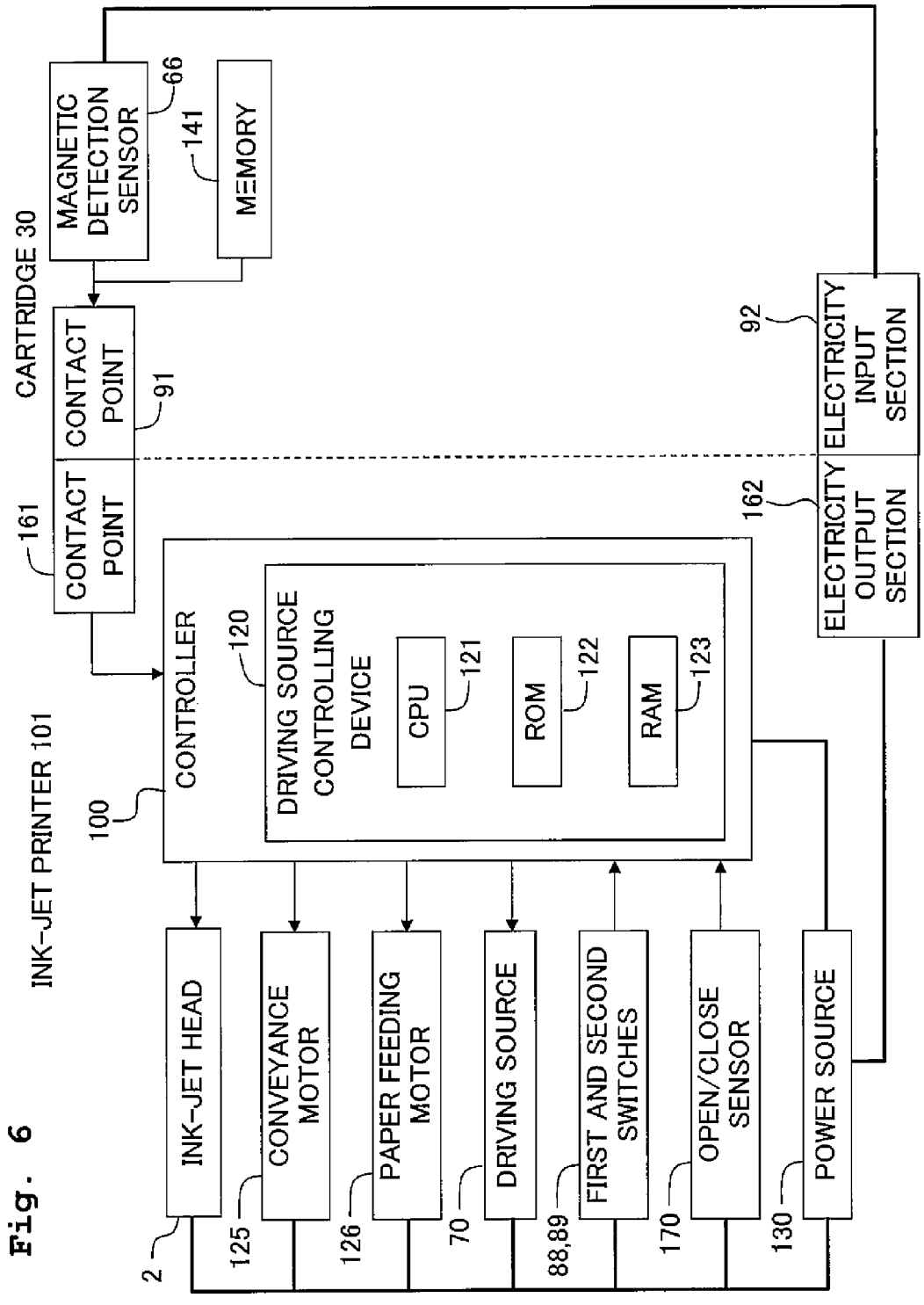

INK-JET PRINTER 101
CARTRIDGE 30
MAGNETIC DETECTION SENSOR
66
MEMORY
141
CONTACT POINT
91
CONTACT POINT
161
ELECTRICITY INPUT SECTION
92
ELECTRICITY OUTPUT SECTION
162
CONTROLLER
100
DRIVING SOURCE CONTROLLING DEVICE
120
CPU
121
ROM
122
RAM
123
INK-JET HEAD
2
CONVEYANCE MOTOR
125
PAPER FEEDING MOTOR
126
DRIVING SOURCE
70
FIRST AND SECOND SWITCHES
88,89
OPEN/CLOSE SENSOR
170
POWER SOURCE
130

Fig. 6

Fig. 7A

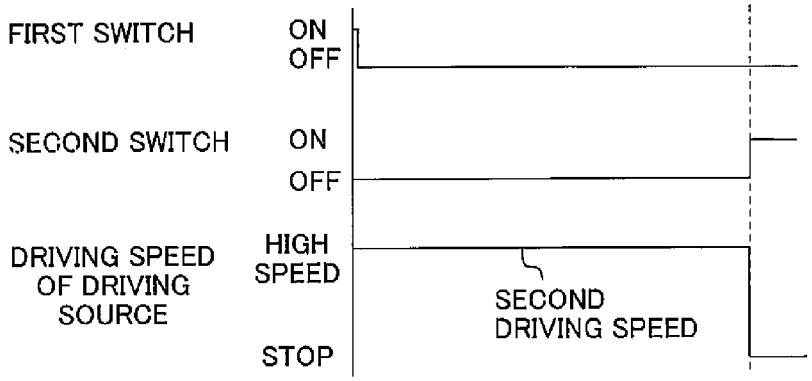


Fig. 7B

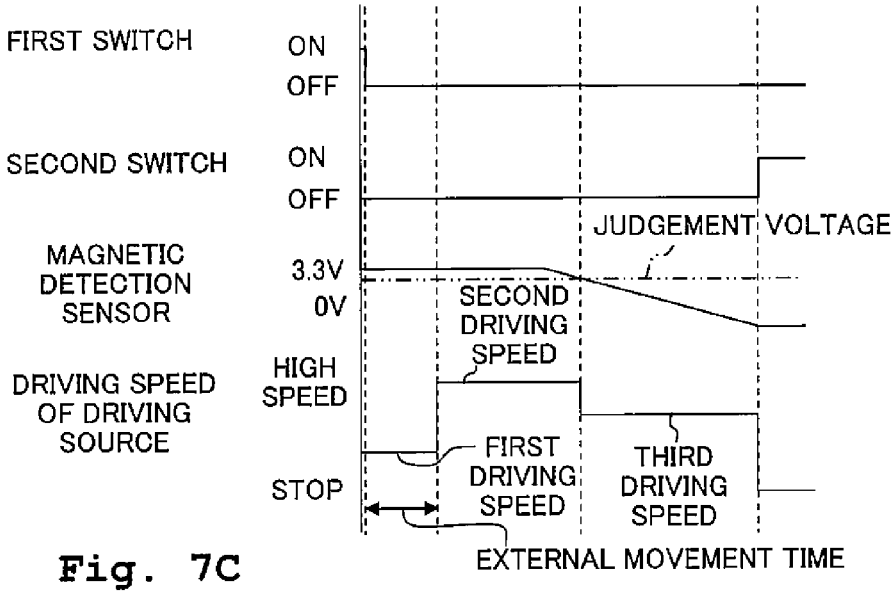


Fig. 7C

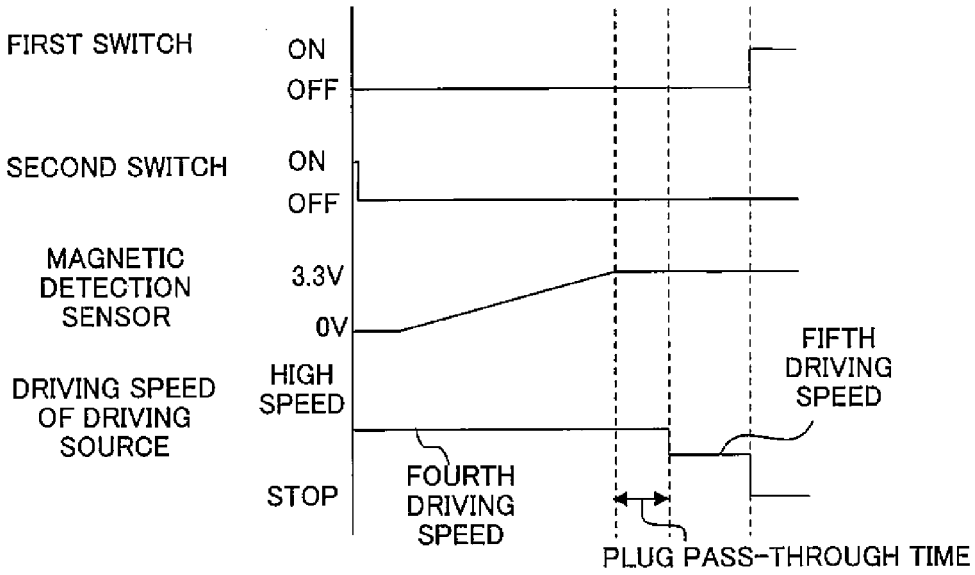


Fig. 8A

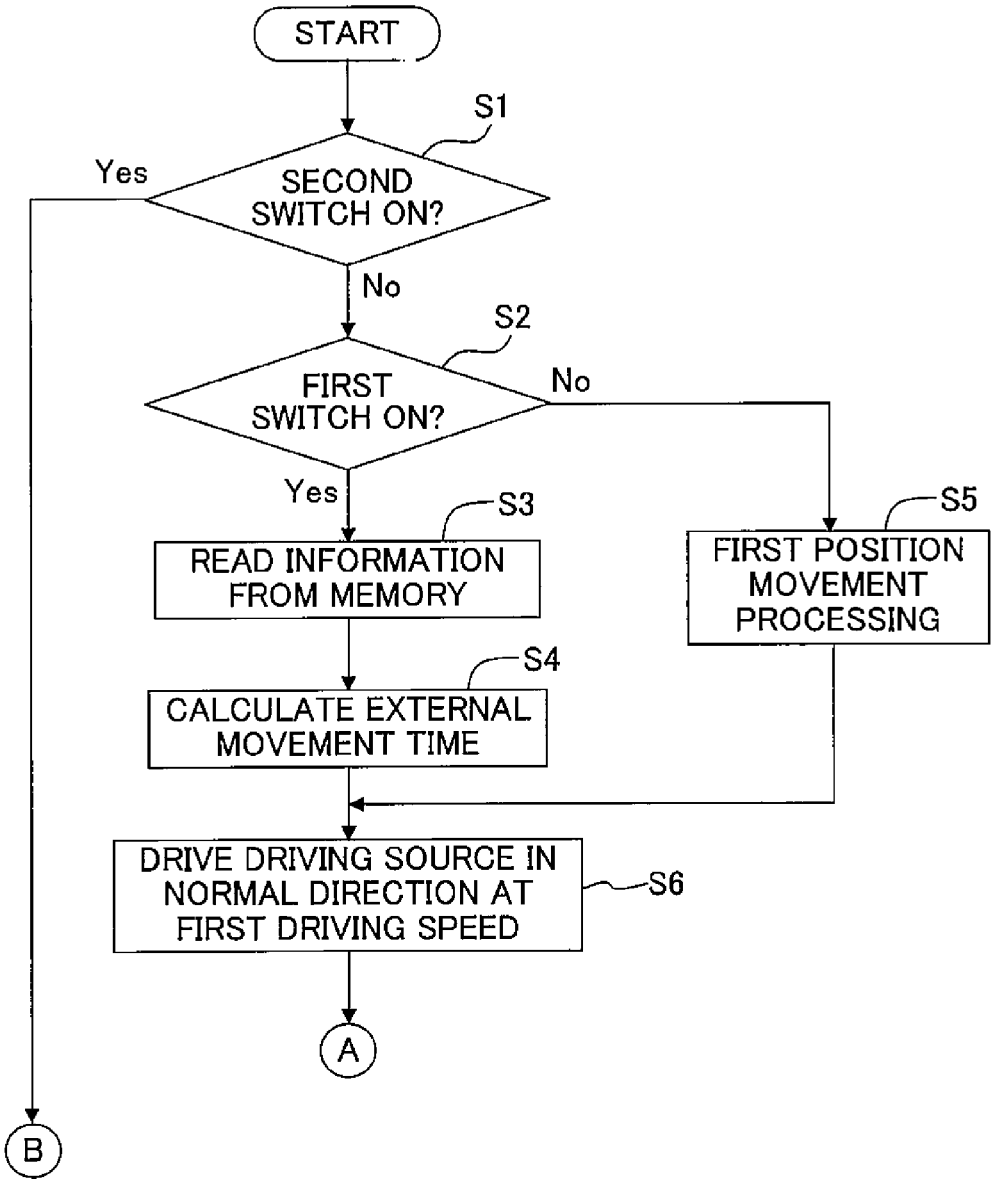

START
S1
SECOND SWITCH ON?
Yes
No
S2
FIRST SWITCH ON?
No
Yes
S3
READ INFORMATION FROM MEMORY
S4
CALCULATE EXTERNAL MOVEMENT TIME
S5
FIRST POSITION MOVEMENT PROCESSING
DRIVE DRIVING SOURCE IN NORMAL DIRECTION AT FIRST DRIVING SPEED
S6
A
B

Fig. 8B

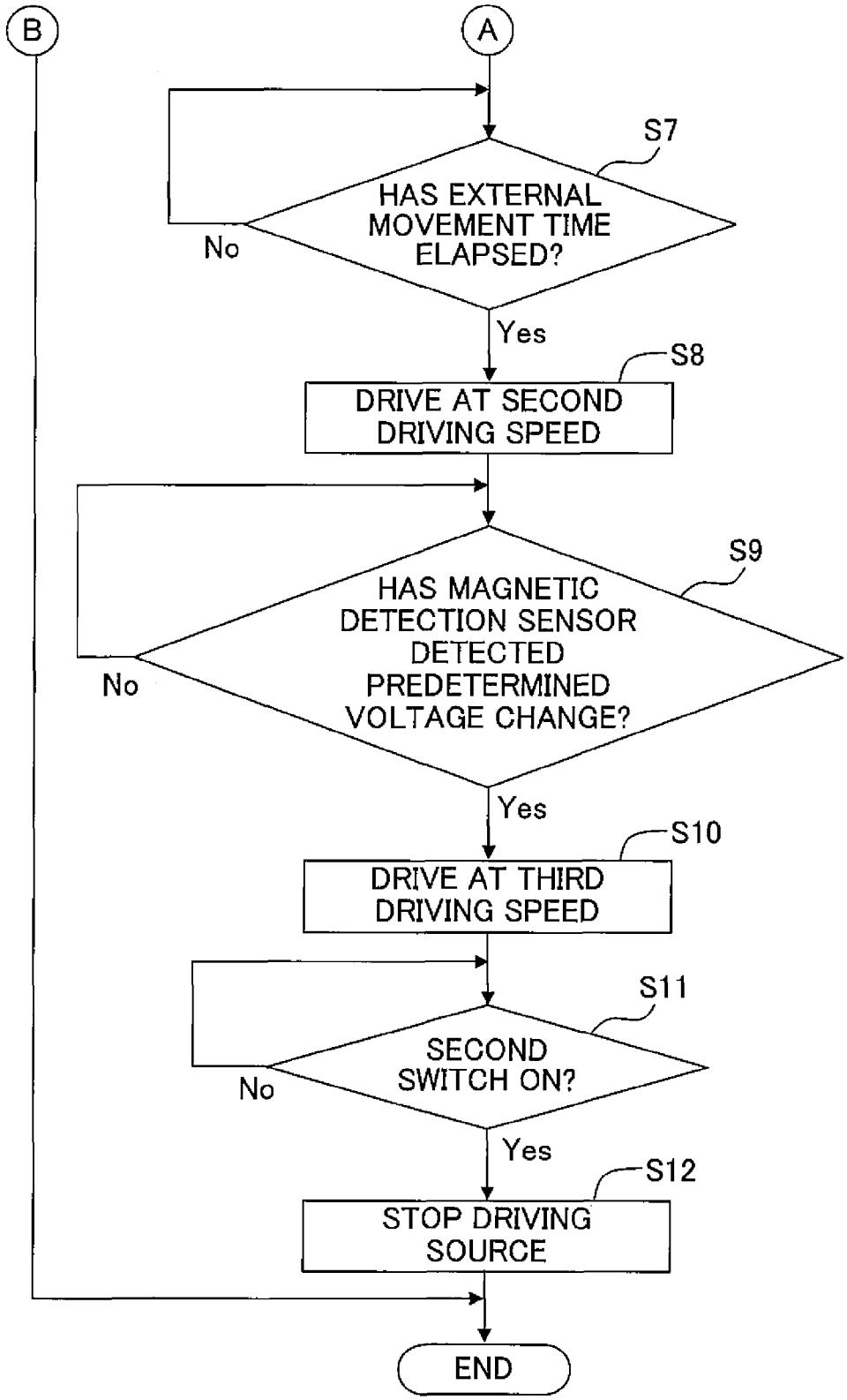

B
A
S7
HAS EXTERNAL MOVEMENT TIME ELAPSED?
No
Yes
S8
DRIVE AT SECOND DRIVING SPEED
S9
HAS MAGNETIC DETECTION SENSOR DETECTED PREDETERMINED VOLTAGE CHANGE?
No
Yes
S10
DRIVE AT THIRD DRIVING SPEED
S11
SECOND SWITCH ON?
No
Yes
S12
STOP DRIVING SOURCE
END

Fig. 9A

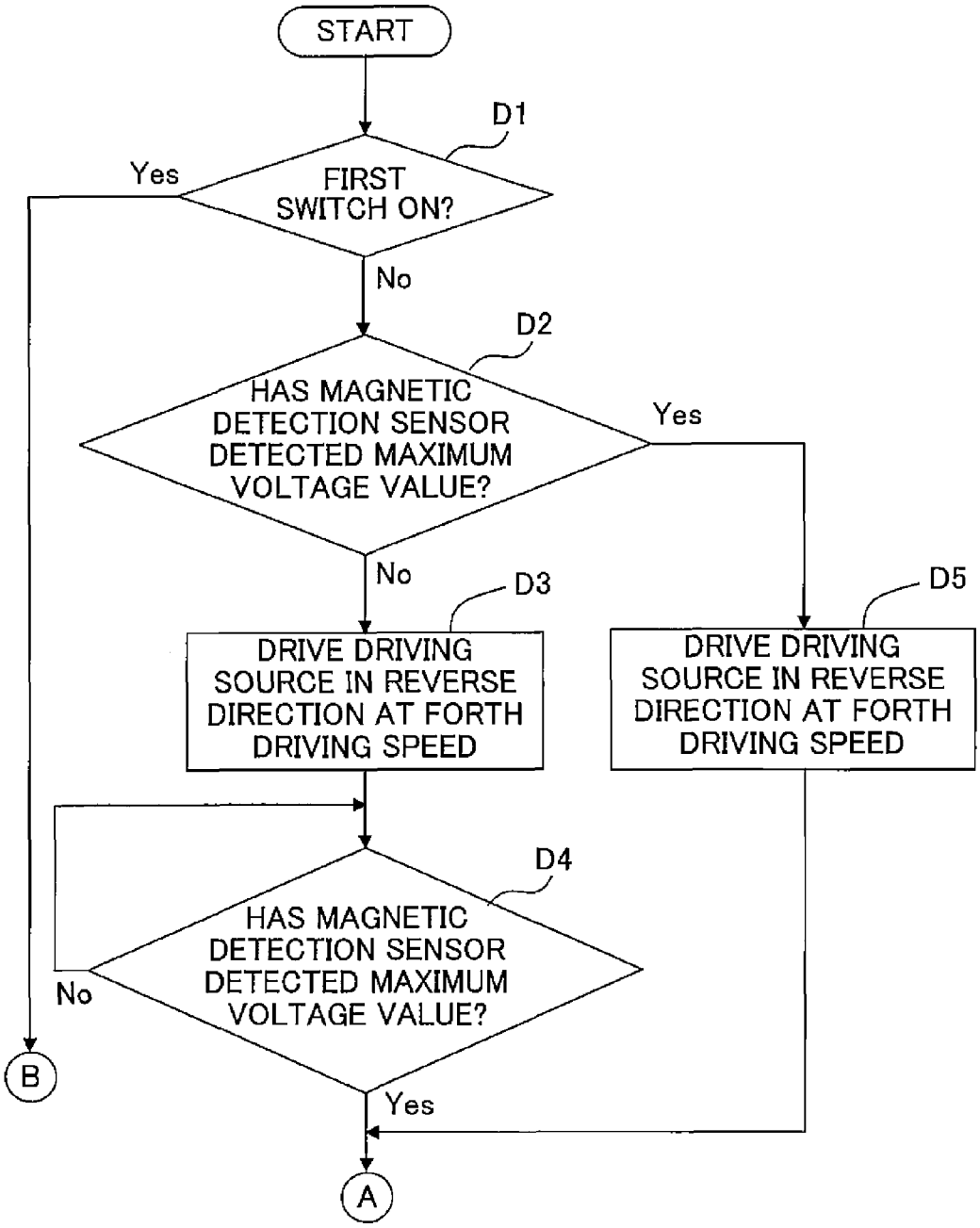

START
D1
FIRST SWITCH ON?
Yes
No
D2
HAS MAGNETIC DETECTION SENSOR DETECTED MAXIMUM VOLTAGE VALUE?
Yes
No
D3
DRIVE DRIVING SOURCE IN REVERSE DIRECTION AT FORTH DRIVING SPEED
D5
DRIVE DRIVING SOURCE IN REVERSE DIRECTION AT FORTH DRIVING SPEED
D4
HAS MAGNETIC DETECTION SENSOR DETECTED MAXIMUM VOLTAGE VALUE?
No
Yes
B
A

Fig. 9B

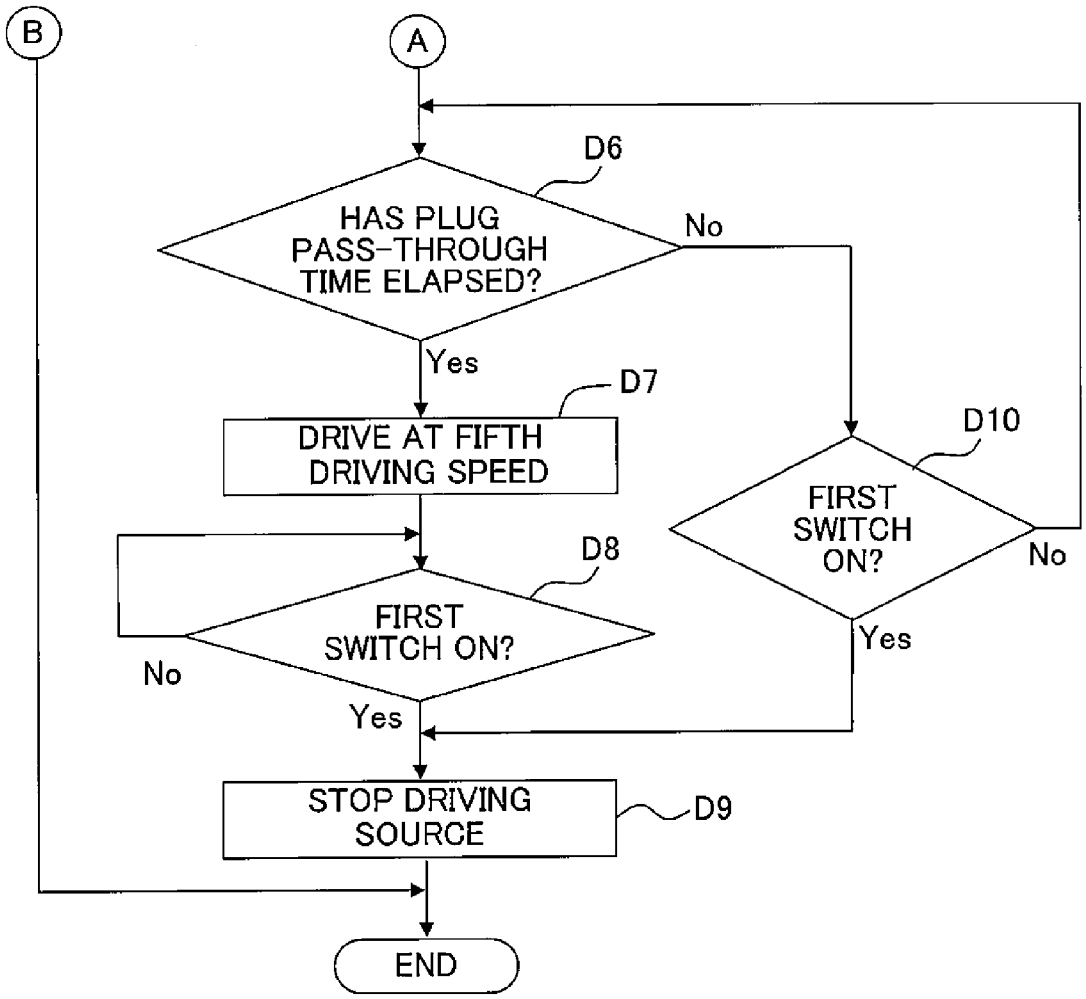

B
A
D6
HAS PLUG PASS-THROUGH TIME ELAPSED?
No
Yes
D7
DRIVE AT FIFTH DRIVING SPEED
D10
FIRST SWITCH ON?
No
Yes
D8
FIRST SWITCH ON?
No
Yes
STOP DRIVING SOURCE
D9
END

Fig. 10A

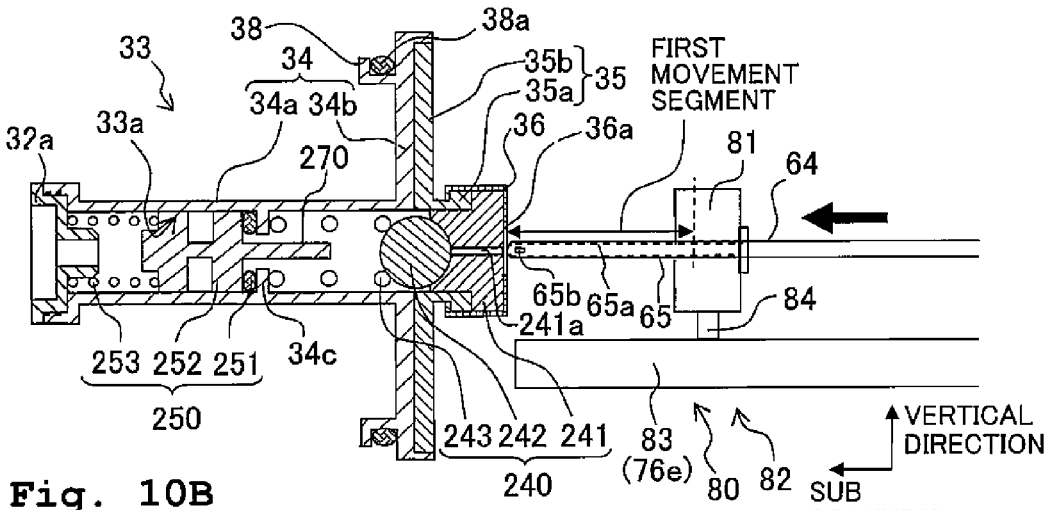


Fig. 10B

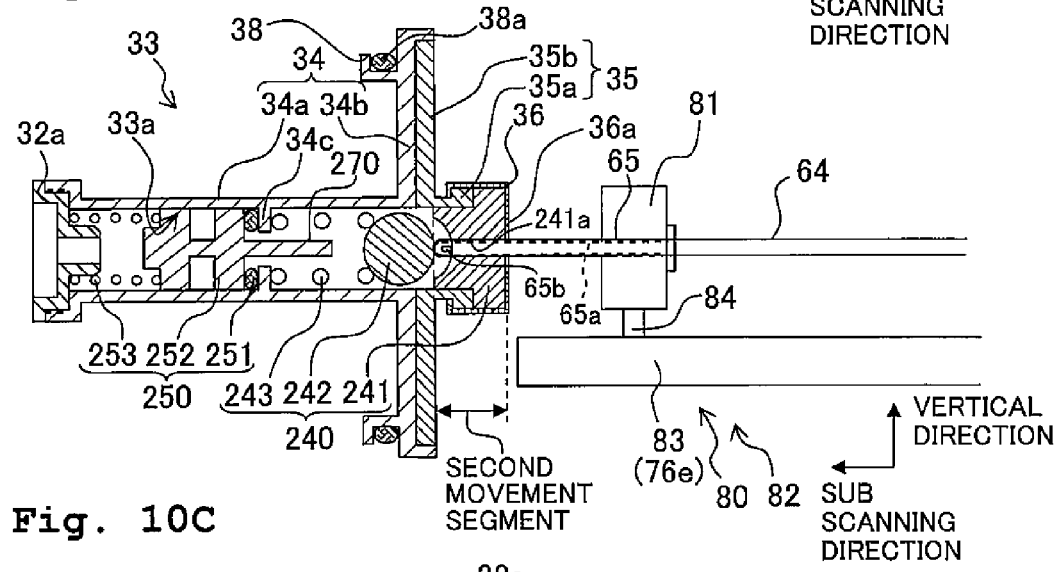
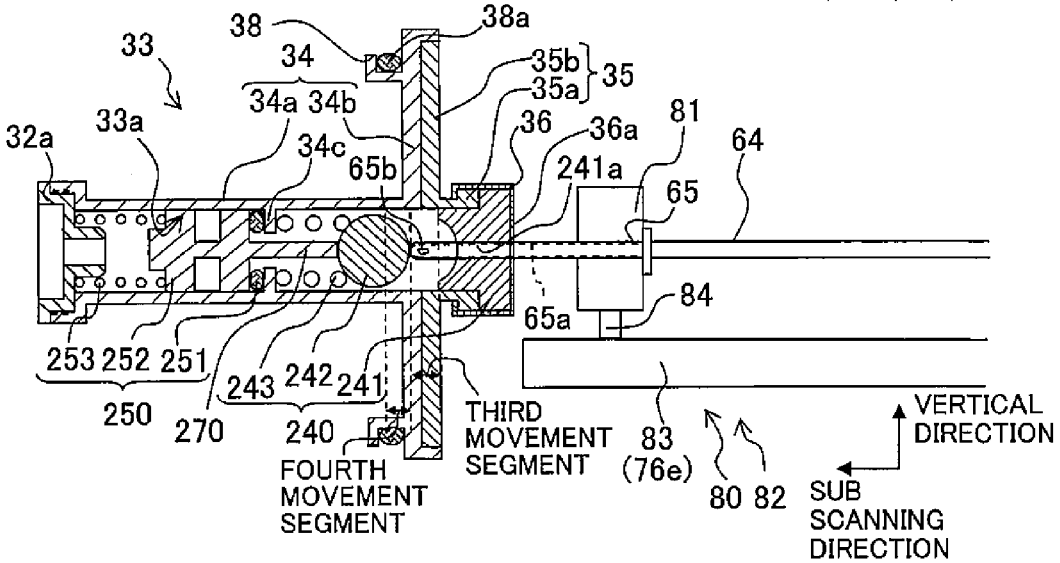


Fig. 10C



CARTRIDGE ACCOMMODATING APPARATUS

CROSS REFERENCE TO RELATED APPLICATION

The present application claims priority from Japanese Patent Application No. 2014-115601 filed on Jun. 4, 2014 the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a cartridge accommodating apparatus capable of accommodating a cartridge which accommodates liquid.

2. Description of the Related Art

There is known an ink-jet printer including an installing section (cartridge accommodating section) configured such that an ink cartridge can be installed therein. Specifically, the ink cartridge to be installed in the installing section is provided with an ink accommodating section (liquid accommodating section) in which ink is accommodated, an ink lead-out tube (liquid lead-out channel) communicated with the ink accommodating section, and first and second valves (first and second blocking members) disposed in the ink lead-out tube. The installing section provided on the ink-jet printer includes a hollow needle (hollow tube). Further, by performing an operation for installing the ink cartridge in the installing section, the hollow needle is allowed to enter into the inside of the ink lead-out tube so as to open (release) the first and second valves.

SUMMARY

Instead of the aspect wherein the hollow tube is allowed to enter into the liquid lead-out channel by performing the operation for installing (accommodating) the cartridge in the cartridge installing section, the inventor of the present teaching found out another aspect wherein a hollow tube is allowed to enter into the inside of the liquid lead-out channel by moving the hollow tube itself with respect to a cartridge accommodated in the cartridge accommodating section. Specifically, this aspect found out by the inventor is provided with a moving mechanism capable of moving the hollow tube, a driving source, a driving force transmitting mechanism configured to transmit the driving force of the driving source to the moving mechanism, and a driving source controller configured to control the driving source. Further, by controlling the driving source with the driving source controller, the hollow tube is allowed to enter into the liquid lead-out channel to thereby release the first and second blocking members disposed in the liquid lead-out channel.

Here, the inventor of the present teaching newly found out that regarding the case of driving the driving source at a constant driving speed to cause the hollow tube to enter into the liquid lead-out channel to thereby release the first and second blocking members disposed in the liquid lead-out channel, there is such a problem that the operation sound generated from the driving force transmitting mechanism while the hollow tube is being moved is great at all times.

The present teaching has been made in view of the above-described circumstances; an object of the present teaching is to provide a cartridge accommodating apparatus capable of reducing the operation sound from the driving force transmitting mechanism to be small.

According to an aspect of the present teaching, there is provided a cartridge accommodating apparatus including: a cartridge accommodating section configured to accommodate a cartridge which includes a liquid accommodating section configured to accommodate liquid, a liquid lead-out channel communicated with the liquid accommodating section and configured to lead the liquid to outside of the liquid accommodating section, a first blocking member configured to block a first portion of the liquid lead-out channel, and a second blocking member configured to block a second portion, of the liquid lead-out channel, between the first portion of the liquid lead-out channel and the liquid accommodating section; a hollow tube configured to introduce the liquid, in the liquid lead-out channel of the cartridge, into inside of the hollow tube; a moving mechanism configured to move the hollow tube between a first position at which a tip portion of the hollow tube is located outside the liquid lead-out channel of the cartridge accommodated in the cartridge accommodating section and a second position at which the tip portion of the hollow tube has entered inside the liquid lead-out channel of the cartridge and the hollow tube is communicated with the liquid accommodating section of the cartridge; a driving source; a driving force transmitting mechanism configured to transmit driving force of the driving source to the moving mechanism; and a driving source controller configured to control driving speed of the driving source, wherein the driving source controller is configured to: drive the driving source at a first driving speed, after causing the hollow tube to move from the first position and until judging that the tip portion of the hollow tube has reached a first contact position at which the tip portion of the hollow tube makes contact with the first blocking member; drive the driving source at a second driving speed which is faster than the first driving speed, after judging that the tip portion of the hollow tube has reached the first contact position and until judging that the tip portion of the hollow tube has reached a release position at which the tip portion of the hollow tube releases the first blocking member; and drive the driving source at a third speed, after judging that the tip portion of the hollow tube has reached a second contact position at which the tip portion of the hollow tube makes contact with the second blocking member.

The operation sound from the driving force transmitting mechanism is greater as the driving speed for driving the driving source becomes faster. Here, force required for moving the hollow tube by a unit distance between the first position to the first contact position is smaller than force required for moving the hollow tube by the unit distance between the first contact position to the release position and is smaller than force required for moving the hollow tube by the unit distance between the second contact position to the second position. Further, the force required for moving the hollow tube by the unit distance between the first contact position to the release position and the force required for moving the hollow tube by the unit distance between the second contact position to the second position depend on resistance forces received by the hollow tube from the first and second blocking members when the hollow tube releases the first and second blocking members, respectively. Thus, in the present teaching, the first driving speed for driving the driving source, during a certain period after the hollow tube is moved from the first position and until a judgment is made that the hollow tube has reached the first contact position, is made to be slower than the second driving speed for driving the driving source during another period after the judgement is made that the tip portion of the hollow tube has reached the first contact position and until a judgement is made that the tip portion of the hollow tube has reached the release position. By doing so, it is possible to

reduce the operation sound generated from the driving force transmitting mechanism to be small during the certain period of time. Furthermore, by setting appropriately each of the second driving speed at which the driving source is driven during another period of time after judging that the hollow tube has reached the first contact position and until judging that the hollow tube has reached the release position, and the third driving speed at which the driving source is driven during yet another period of time after judging that the hollow tube has reached the second contact position, it is possible to reduce the operation sound generated from the driving force transmitting mechanism during any one of these periods of time to be small, in some cases.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic configuration diagram of an ink-jet printer provided with a cartridge accommodating apparatus according to an embodiment of the present teaching.

FIG. **2**A is a perspective view of a cartridge which can be accommodated in a cartridge accommodating section depicted in FIG. **1**, and FIG. **2**B is a schematic configuration diagram of inside of the cartridge.

FIG. **3**A is a partial cross sectional view of a hollow tube and the cartridge in a state that the hollow tube is arranged at a first position, FIG. **3**B is a partial cross sectional view of the hollow tube and the cartridge in a state that the hollow tube is arranged at a second contact position, and FIG. **3**C is a partial cross sectional view of the hollow tube and the cartridge in a state that the hollow tube is arranged at a second position.

FIG. **4**A is a partial plan view of the cartridge in a state that the cartridge is accommodated in the cartridge accommodating section, and FIG. **4**B is a perspective view depicting a moving mechanism configured to move the hollow tube and a driving force transmitting mechanism configured to transmit the driving force of a driving source to the moving mechanism.

FIG. **5**A is a bottom view of the moving mechanism and the driving force transmitting mechanism in a state that a rotating cam is located at an origin position, and FIG. **5**B is a bottom view of the moving mechanism and the driving force transmitting mechanism in a state that the rotating cam is located at a maximally rotated position.

FIG. **6** is a block diagram depicting the electric configurations of the ink-jet printer and cartridge.

FIG. **7**A depicts time charts for a first switch, a second switch and a driving speed for the driving source each in an inserting operation (inserting processing) according to a comparative example; FIG. **7**B depicts time charts for the first switch, the second switch, a magnetic detection sensor and the driving speed for the driving source each in an inserting operation according to the embodiment; and FIG. **7**C depicts time charts for the first switch, the second switch, the magnetic detection sensor and the driving speed for the driving source each in a removing operation (removing processing) according to the embodiment.

FIGS. **8**A and **8**B illustrate a flow chart of an operation of the cartridge accommodating apparatus in a case that a cover of the cartridge accommodating apparatus is switched from an open state to a close state.

FIGS. **9**A and **9**B illustrate a flow chart of an operation of the cartridge accommodating apparatus in a case that the cover of the cartridge accommodating apparatus is switched from the close state to the open state.

FIGS. **10**A to **10**C each depict a partial cross sectional view of a hollow tube and a cartridge according to a modified embodiment, wherein FIG. **10**A depicts a state that the hollow tube is arranged at a first contact position, FIG. **10**B depicts a state that the hollow tube is arranged at a release position, and FIG. **10**C depicts a state that the hollow tube is arranged at a second contact position.

DESCRIPTION OF THE EMBODIMENTS

An ink-jet printer **101** (hereinafter referred to as the "printer **101**") provided with a cartridge accommodating apparatus **60** according to an embodiment of the present teaching has a casing **101***a* having a rectangular parallelepiped shape, as depicted in FIG. **1**. A paper discharge section **15** is disposed on the top plate of the casing **101***a*. Further, the inside of the casing **101***a* is divided into three spaces A, B and C in this order from above. An ink-jet head **2** configured to jet black ink, a conveyance mechanism **21** configured to convey a paper P, and a controller **100** configured to control the entire operation of the printer **101** are arranged in the space A. A paper feeding mechanism **25** configured to supply the paper P is arranged in the space B, and a cartridge accommodating apparatus **60** capable of accommodating a cartridge **30** is arranged in the space C.

The ink-jet head **2** (hereinafter referred to as the "head **2**") extends in a main scanning direction, and is supported by the casing **101***a* via a frame **3**. Namely, the printer **101** is a monochrome ink-jet printer of the line system. The head **2** has a stacked body constructed by adhering or joining a channel unit and an actuator to each other, wherein the channel unit has ink channels including pressure chambers formed therein, and the actuator is configured to apply pressure to the ink inside the pressure chambers. Further, the bottom surface of the head **2** is a jetting surface **2***a* in which a plurality of discharge ports via which the ink is jetted are formed. The head **2** is connected to a flexible tube (not depicted in the drawings) communicated with the ink channels formed inside the head **2**. The tube is connected to an ink supply path **64** (to be described later on; see FIG. **3**). In this embodiment, a sub scanning direction is a direction parallel to a conveyance direction in which the paper P is conveyed by nip rollers **23***c* and **23***d* of a conveying mechanism **21** (to be described later on). Further, in this embodiment, the main scanning direction is a direction orthogonal to the sub scanning direction and along a horizontal plane (i.e. orthogonal to the sub scanning direction and a vertical direction).

The paper feeding mechanism **25** has a paper feeding tray **26** capable of accommodating a plurality of sheets of the paper P therein, and a paper feeding roller **27** attached to the paper feeding tray **26**. The paper feeding roller **27** is rotated when a paper feeding motor **126** (see FIG. **6**) is driven under the control of the controller **100** to thereby feed out a sheet of the paper P, among the plurality of sheets of the paper P, which is located at the uppermost position in the paper feeding tray **26**.

The conveyance mechanism **21** includes a guide **22** and nip rollers **23***a* to **23***f*. The guide **22** defines a conveyance path of the paper P starting from the paper feeding mechanism **25**, passing between the head **2** and a platen **19** and arriving at the paper discharge section **15**. The nip rollers **23***a* to **23***f* are arranged along the conveyance path. The nip rollers **23***a* to **23***f* are rotated when a conveyance motor **125** (see FIG. **6**) is driven under the control of the controller **100** so as to apply the conveyance force to the paper P fed out by the paper feeding mechanism **25**. When the paper P conveyed by the conveyance mechanism **21** passes a space between the jetting surface **2***a* of the head **2** and the platen **19**, the ink is jetted from the jetting ports of the head **2** under the control by the controller **100**, thereby forming a desired monochrome image

on the paper P. The paper P, having the image formed thereon, is conveyed further by the conveyance mechanism **21** and is discharged to the paper discharge section **15**.

Next, before the cartridge accommodating apparatus **60** is explained, the cartridge **30** configured to be accommodated in an attachable/detachable manner with respect to the cartridge accommodating apparatus **60** will be explained with reference to FIGS. **2**A, **2**B, **3**A to **3**C and **6**. Note that in FIG. **6**, thick lines indicate electric power supply lines, and narrow lines indicate signal lines. As depicted in FIGS. **2**A and **2**B, the cartridge **30** has a casing **31** having a substantially rectangular parallelepiped shape; an ink bag (liquid accommodating section) **32** which is arranged inside the casing **31** and in which an ink is filled (accommodated or stored); an ink lead-out tube **33** of which one end portion is communicated with the ink bag **32**; and a first blocking member **40** (see FIGS. **3**A to **3**C) and a second blocking member **50** (see FIGS. **3**A to **3**C).

As depicted in FIG. **2**B, the casing **31** is divided or partitioned such that two chambers **31***a* and **31***b* are formed inside the casing **31**. The ink bag **32** is arranged in the chamber **31***a* on one side, and the ink lead-out tube **33** is arranged in the chamber **31***b* on the other side. The ink lead-out tube **33** includes tubes **34** and **35** which are connected to each other. As depicted in FIGS. **3**A to **3**C, an ink channel (liquid lead-out channel) **33***a* extending in the sub scanning direction and communicated with the ink bag **32** is formed inside the tubes **34** and **35**. Namely, the ink channel **33***a* is constructed of two continued spaces that are the space inside the tube **34** and the space inside the tube **35**.

The tube **35** includes a main portion **35***a* having a cylindrical shape and extending in the sub scanning direction, and a flange **35***b* having a disc shape with a circular-shaped opening formed at the central portion thereof. The tube **34** has a main portion **34***a* having a cylindrical shape and extending in the sub scanning direction, and a flange **34***b* having a disc shape with a circular-shaped opening formed at the central portion thereof. A connecting section **32***a* is fitted into one end of the main portion **34***a*, and the flange **35***b* of the tube **35** is fitted into the other end of the main portion **34**, via the flange **34***b*. The flange **34***b* extends outwardly from the circumferential edge defining the opening at the other end portion of the main portion **34***a*. Further, the flange **34***b* has an annular-shaped projection **38** which is formed in the flange **34***b* and in which an O-ring **38***a* is disposed. As depicted in FIG. **2**B, the space between the casing **31** and the annular-shaped projection **38** is sealed by the O-ring **38***a*.

The first blocking member **40** is a member capable of blocking (closing) the ink channel **33***a* at an end portion (first portion) of the main portion **35***a*. As depicted in FIGS. **3**A to **3**C, the first blocking member **40** includes a plug **41** having a substantially columnar shape. The plug **41** is formed of an elastic material such as a rubber, and is provided in a compressed state such that the plug **41** blocks (closes) an opening **35***x* (lead-out port of the ink channel **33***a*) which is located at the end portion of the main portion **35***a*. The plug **41** includes a portion arranged inside the opening **35***x* and a portion arranged outside the opening **35***x*. A cap **36** is disposed at the end portion of the main portion **35***a* and at the exterior of the plug **41**. Since the cap **36** covers the plug **41** fitted into the end portion of the main portion **35***a*, it is possible to prevent the plug **41** from falling or detaching from the main portion **35***a*. Note that an opening **36***a* is formed at the central portion of the cap **36**, and an end surface of the plug **41** is exposed via the opening **36***a*.

The second blocking member **50** is a valve member arranged inside the tube **34** and capable of blocking (closing) the ink channel **33***a* inside the tube **34** (second portion). The second blocking member **50** includes an O-ring **51** (valve seat), a valve body **52** and a coil spring **53**. The O-ring **51** is formed of an elastic material such as a rubber, and is fixed in a state that the O-ring **51** is brought into contact with the plug **41**, in the inner circumferential surface inside the tube **35**. The O-ring **51** is interposed between the valve body **52** and the plug **41**. The valve body **52** is a spherical body formed of a magnetic material, and has a diameter smaller to some extent than the inner diameter of the tube **34**. Further, the valve body **52** is a movable body which is movable along the sub scanning direction inside the tube **34** as a predetermined range between the plug **41** and the ink bag **32**. The coil spring **53** has one end making contact with the valve body **52** and the other end making contact with an annular-shaped projection **34***c*, which is formed inside the tube **34** and which projects inwardly from the inner circumferential surface of the tube **34**, and the coil spring **53** urges the valve body **52** toward the O-ring **51** at all times. Namely, the coil spring **53** urges the valve body **52** toward the opening **36***a* so that the valve body **52** is brought into contact with the O-ring **51**, thereby blocking the communication with the ink channel **33***a*. Namely, the communication between the tubes **34** and **35** is blocked (closed), which in turn brings the second blocking member **50** into a close state.

Note that the elements or components constructing the first and second blocking members **40** and **50** are arranged in a linear manner along the sub scanning direction. Therefore, both of the first and second blocking members **40** and **50** are switched from the close state into the open state by inserting a hollow tube **65** with respect to the cartridge **30** (to be described later on). Further, in the embodiment, the resistance force received by the hollow tube **65** from the first blocking member **40** when the hollow tube **65** releases the first blocking member **40** is greater than the resistance force received by the hollow tube **65** from the second blocking member **50** when the hollow tube **65** releases the second blocking member **50**. Namely, force required for moving the hollow tube **65** by a unit distance when allowing the hollow tube **65** to penetrate through the plug **41** of the first blocking member **40** is greater than force required for moving the hollow tube **65** by the unit distance and against the urging force generated by the coil spring **53** in a state that the tip portion of the hollow tube **65** is brought into contact with the valve body **52** of the second blocking member **52**.

Regarding the foregoing configuration, in a state that the cartridge **30** is accommodated in the cartridge accommodating apparatus **60**, when the hollow tube **65** is moved by a moving mechanism **80** along the sub scanning direction toward the cartridge **30** (as will be described later on), the hollow tube **65** penetrates through a substantially central portion of the plug **41** via the opening **36***a* in the sub scanning direction (see FIG. **3**B). At this time, the first blocking member **40** is switched from the close state under which the first blocking member **40** blocks (closes) the ink channel **33***a* into the open state under which the first blocking member **40** opens (releases) the ink channel **33***a*. When the first blocking member **40** is in the open state, a hole **65***b* formed at a tip portion of the hollow tube **65** is arranged inside the ink channel **33***a*, and a hollow portion **65***a* defined inside the hollow tube **65** communicates with a portion, of the ink channel **33***a*, located between the second blocking member **50** and the first blocking member **40**, via the hole **65***b*. Note that when a portion, of the hollow tube **65**, in which the hole **65***b* is formed penetrates through the plug **41**, the hollow tube **65** is allowed to communicate with the ink channel **33***a*. However, until the second blocking member **50** is brought into the open state, the

ink inside the ink bag **32** does not inflow into the hollow portion **65***a*. Further, in this situation, a through hole is formed in the plug **41** by being penetrated with the hollow tube **65**, a portion of the plug **41** surrounding the through hole makes tight contact with the outer circumferential surface of the hollow tube **65** by the elasticity of the plug **41**, thereby preventing the ink from leaking between the through hole of the plug **41** and the hollow tube **65**.

Afterwards, the tip portion of the hollow tube **65** is brought into contact with the valve body **52**. Then, when the hollow tube **65** enters further into the ink channel **33***a*, the valve body **52** is pushed and moved by the hollow tube **65**, which in turn causes the valve body **52** to be separated away from the O-ring **51**. At this time, the second blocking member **50** is switched from the close state to the open state. In a state that the second blocking member **50** is in the open state, a space defined between one end portion of the tube **34** and the O-ring **51** in the ink channel **33***a* and another space defined between the O-ring **51** and the plug **41** in the ink channel **33***a* are communicated with each other, thereby making it possible to lead the ink stored in the ink bag **32** to the outside of the ink bag **32**. Namely, as depicted in FIG. **3**C, the ink bag **32** and the hollow tube **65** are communicated with each other when both of the first and second blocking members **40** and **50** are in the open state. With this, the ink can be supplied to the head **2**.

On the other hand, in a case of removing the cartridge **30** from the cartridge accommodating apparatus **60**, when the hollow tube **65** is moved by the moving mechanism **80** along the sub scanning direction in a separating direction separating away from the cartridge **30** (as will be described later on), the valve body **52** is moved in a direction approaching toward the O-ring **51** by the urging force of the coil spring **53**. Then, when the valve body **52** is brought into contact with the O-ring **51**, the second blocking member **50** is switched from the open state to the close state. Further, when the hollow tube **65** is moved farther in the separating direction away from the cartridge **30**, the hollow tube **65** is separated away from the plug **41**, thereby blocking the communication between the hollow tube **65** and the ink channel **33***a*. At this time, the through hole of the plug **41** becomes small, due to the elasticity of the portion of the plug **41** surrounding the through hole, to such an extent that the ink is prevented from leaking.

As depicted in FIG. **4**A, a contact point **91** and an electricity input section **92** are provided on a side surface, of the chamber **31***a*, on the side closer to the opening **36***a* in the casing **31**. The contact point **91** is electrically connected to a magnetic detection sensor **66** and a memory **141** (to be described later on), as depicted in FIG. **6**. The electricity input section **92** is electrically connected to the magnetic detection sensor **66** and the memory **141**, and supplies the electricity to the magnetic detection sensor **66** and the memory **141** by being electrically connected to an electricity output section **162** (to be described later on).

Further, the magnetic detection sensor **66**, connected to the contact point **91**, is disposed in the chamber **31***b* of the casing **31** (see, for example, FIGS. **2**B and **3**A to **3**C). The magnetic detection sensor **66** is constructed of a Hall element, and is driven at a voltage based on a signal transmitted from the controller **100** via the contact point **91**. As depicted in FIG. **3**A, when the valve body **52** makes contact with the O-ring **51** to bring the second blocking member **50** into the close state, the strength of the magnetic field detected by the magnetic detection sensor **66** is great, and the magnetic detection sensor **66** outputs, to the controller **100**, a signal indicating a greatest voltage value (hereinafter referred to as the "maximum voltage value"; 3.3 V in the embodiment). As depicted in FIG. **3**C, when the valve body **52** is moved leftward to be separated away from the O-ring **51** and as the distance between the valve body **52** and the magnetic detection sensor **66** is greater, the strength of the magnetic field detected by the magnetic detection sensor **66** becomes smaller, which in turn also causes the voltage value indicated by the signal outputted from the magnetic detection sensor **66** to be smaller. As a modified example, it is allowable to provide such a configuration wherein the magnetic detection sensor **66** outputs a signal indicating a smallest voltage value to the controller **100** when the valve body **52** makes contact with the O-ring **51**, and that the voltage value indicated by the signal outputted from the magnetic detection sensor **66** becomes greater as the valve body **52** is separated away from the O-ring **51** and is moved leftward as depicted in FIG. **3**C. As described above, the voltage value indicated by the signal outputted from the magnetic detection sensor **66** is proportional to the strength of the magnetic field which changes depending on the distance between the magnetic detection sensor **66** and the valve body **52** as the detection target, and the controller **100** is capable of judging regarding the position of the valve body **52** based on the voltage value received from the magnetic detection sensor **66**. Note that in the embodiment, information regarding the maximum voltage value is stored in advance in a RAM **123** of the controller **100**.

Next, an explanation will be given about the cartridge accommodating apparatus **60** with reference to FIGS. **1**, **4**A, **4**B, **5**A and **5**B. As depicted in FIGS. **4**A and **4**B, the cartridge accommodating apparatus **60** includes a cartridge accommodating section **61**, the hollow tube **65**, a driving source **70**, the driving force transmitting mechanism **75**, the moving mechanism **80**, and a driving source controlling device **120** (an example of the driving source controller; see FIG. **6**). The cartridge accommodating section **61** has a recessed portion **62** capable of accommodating the cartridge **30** therein, and a cover **63**. An opening **62***a* of the recessed portion **62** is an insertion port (insertion opening) into which the cartridge **30** is inserted. The printer **101** of this embodiment is configured such that the insertion and removal (detachment) of the cartridge **30** relative to the cartridge accommodating section **61** is performed in the sub scanning direction.

The cover **63** is configured to be openable/closable, with the horizontal shaft at a lower end portion of the opening **62***a* as the fulcrum (rocking shaft). The opening/closing operation of the cover **63** is executed by a user. Note that in order to exchange the cartridge **30**, the user may open the cover **63** and remove the cartridge **30** from the cartridge accommodating section **61**, and then may install a new cartridge **30** to the cartridge accommodating section **61**. Further, an open/close sensor **170** connected to the controller **100** (driving source controlling device **120**) is disposed in the opening **62***a* of the recessed portion **62**. The open/close sensor **170** is a mechanical switch which detects the opening/closing of the cover **63** based on whether or not the open/close sensor **170** makes contact with the cover **63**, and the open/close sensor **170** outputs a signal indicating a result of detection to the controller **100**. By receiving the signal from the open/close sensor **170**, the controller **100** can detect the opening/closing of the cover **63**.

As depicted in FIG. **4**A, a contact point **161** electrically connected to the controller **100**, and an electricity output section **162** configured to output the electricity from a power source **130** (see FIG. **6**) disposed on the body of the printer **101** are disposed in the vicinity of a bottom portion of the recessed portion **62**. The power source **130** is disposed inside the casing **101***a* and supplies the electricity to the respective parts or components of the printer **101**. The contact point **161** is arranged at a position facing the contact point **91**, and is

electrically connected to the contact point **91** when the cartridge **30** is installed in the cartridge accommodating section **61**. With this, a signal can be transmitted and received between the cartridge **30** and the printer **101**. The electricity output section **162** is arranged at a position facing the electricity input section **92**, and is electrically connected to the electricity input section **92** when the cartridge **30** is installed in the cartridge accommodating section **61**, in a similar manner regarding the contact point **161**. With this, the electricity is supplied from the power source **130** to the magnetic detection sensor **66** and the memory **141** via the electricity output section **162** and the electricity input section **92**.

The hollow tube **65** is a tube configured to introduce, to an ink supply path **64**, the ink accommodated in the ink bag **32** of the cartridge **30**. As depicted in FIGS. **3**A to **3**C, the hollow tube **65** extends in the sub scanning direction and is arranged at a position facing the ink lead-out tube **33** of the cartridge **30**. The hollow tube **65** has a hollow portion **65***a* formed in the hollow tube **65** and communicating with the ink supply path **64**, and a hole **65***b* formed in the hollow tube **65** in the vicinity of a tip portion of the hollow tube **65** and communicating the hollow portion **65***a* with the outside of the hollow tube **65**.

The driving source **70** is a driving motor capable of rotating in the normal and reverse directions as depicted in FIG. **4**B, and the rotational direction and driving speed of the driving motor **70** are controlled by the driving source controlling device **120**. The driving force transmitting mechanism **75** is a mechanism configured to transmit the driving force of the driving source **70** to the moving mechanism **80**, and is provided with gears **76***a* to **76***e*. The gear **76***a* (first gear) is a motor pinion gear connected to a rotation shaft **70***a* of the driving source **70**. The gear **76***b* is directly meshed with the gear **76***a*, the gear **76***c* is directly meshed with the gear **76***b*, the gear **76***d* is directly meshed with the gear **76***c*, and the gear **76***e* (second gear) is directly meshed with the gear **76***d*. Namely, the gear **76***e* is indirectly meshed with the gear **76***a* via the gears **76***b* to **76***d*. Accordingly, when the driving source **70** is driven, the driving force of the driving source **70** is transmitted to the gear **76***e* via the gears **76***a* to **76***d*, thereby rotating the gear **76***e*.

The moving mechanism **80** is a mechanism configured to move the hollow tube **65** between a first position (see FIG. **3**A) and a second position (see FIG. **3**C) in the sub scanning direction, and the moving mechanism **80** is provided with a supporting body **81** and a converting mechanism **82**. The first position is a position at which the tip portion of the hollow tube **65** is located at the outside of the ink channel **33***a* of the cartridge **30** accommodated in the cartridge accommodating section **61**, and the second position is a position at which the tip portion of the hollow tube **65** has entered into the inside of the ink channel **33***a* and the hollow tube **65** is communicated with the ink bag **32** of the cartridge **30**. The supporting body **81** is configured to support the hollow tube **65** and is guided by a regulating member (not depicted in the drawings) so that the supporting member **81** is movable only along the sub scanning direction.

The converting mechanism **82** is a mechanism configured to convert the rotating operation of the gear **76***e* into a linear operation so as to move the supporting body **81** along the sub scanning direction. The converting mechanism **82** is provided with a rotating cam **83** which is arranged inside the gear **76***e*, and a slider **84** of which upper end portion is fixed to the lower surface of the supporting member **81**. The rotating cam **83** has a rotation shaft **85** that is coaxial with the rotation shaft of the gear **76***e* as depicted in FIGS. **5**A and **5**B, and the rotating cam **83** is rotated together with the rotation of the gear **76***e*. The rotating cam **83** has a cam groove **83***a* to which the slider **84** is engaged. The cam groove **83***a* has a base end portion located at the circumferential edge of the rotation shaft **85**, and a distal end portion located on the side of the outer circumferential surface of the rotating cam **83** father from the base end portion, and is extended in a spiral form around the rotating shaft **85** from the base end portion toward the distal end portion.

In a state that the rotating cam **83** is located at a position depicted in FIG. **5**A (hereinafter referred to as the "origin position"), the slider **84** is engaged with or fitted to the base end portion of the cam groove **83***a*. At this situation, the hollow tube **65** is arranged at the first position (see FIG. **3**A). Namely, in this state, the tip portion of the hollow tube **65** is arranged at the outside of the ink channel **33***a* in the cartridge **30** accommodated in the cartridge accommodating section **61**, and the first and second blocking members **40** and **50** are in the close state closing the ink channel **33***a*. Namely, the ink bag **32** and the hollow tube **65** are not communicated with each other.

When the driving source **70** is driven from the state depicted in FIG. **5**A so as to rotate the gear **76***e*, the rotating cam **83** is rotated clockwise, then the slider **84** receives a force from the inner surface of the cam groove **83***a*, which in turn causes the slider **84** (supporting body **81**) to move leftward in FIGS. **5**A and **5**B. Accompanying with this, the hollow tube **65** is moved from the first position toward the second position. Then, in a state that the rotating cam **83** is located at the position depicted in FIG. **5**B (hereinafter referred to as a "maximally rotated position"), the slider **84** is engaged with (fitted to) the distal end portion of the cam groove **83***a*. In this situation, the hollow tube **65** is arranged at the second position (see FIG. **3**C). Namely, in this state, the tip portion of the hollow tube **65** has entered into the inside of the ink channel **33***a* of the cartridge **30** accommodated in the cartridge accommodating section **61**, and the first and second blocking members **40** and **50** are brought into the release state releasing the ink channel **33***a*. Namely, the ink bag **32** is allowed to communicate with the hollow tube **65**. Further, when the rotating cam **83** is rotated counterclockwise from the state that the rotating cam **83** is located at the maximally rotated position, the hollow tube **65** is consequently moved from the second position toward the first position. In the following description, a rotation direction of the driving source **70** for rotating the rotating cam **83** in the clockwise direction is referred to as "normal direction", and a rotation direction of the driving source **70** for rotating the rotating cam **83** in the counterclockwise direction is referred to as "reverse direction".

The cartridge accommodating apparatus **60** has a first switch **88** for detecting the origin position of the rotating cam **83**, and a second switch **89** for detecting the maximally rotated position of the rotating cam **83**. Further, the rotating cam **83** has a projection **83***b* disposed on the outer circumferential portion thereof and provided for operating the first and second switches **88** and **89**. In a state that the rotating cam **83** is located at a certain angle position, the first switch **88** is brought into an ON state by being contacted with the projection **83***b* of the rotating cam **83** and the second switch **89** is brought into an OFF state by being separated away from (not being contacted by) the projection **83***b* of the rotating cam **83**. On the other hand, in a state that the rotating cam **83** is located at another angle position, the first switch **88** is brought into the OFF state by being separated away from the projection **83***b* of the rotating cam **83** and the second switch **89** is brought into the ON state by being contacted with the projection **83***b* of the rotating cam **83**. In this embodiment, setting is made such that at the angle position of the rotating cam **83** with which the first

switch **88** is in the ON state, the rotation cam **83** is located at the origin position, namely the hollow tube **65** is located at the first position. Further, another setting is made such that at the angle position of the rotating cam **83** with which the second switch **89** is in the ON state, the rotation cam **83** is located at the maximally rotated position, namely the hollow tube **65** is located at the second position. Accordingly, the controller **100** (driving source controlling device **120**) is capable of recognizing (judging) whether the hollow tube **65** is arranged at the first position or at the second position based on a signal from the first switch **88** and a signal from the second switch **98**.

The driving source controlling device **120** is a device configured to control the rotation direction and driving speed of the driving source **70** and is a part of the controller **100**. As depicted in FIG. **6**, the controller **100** has a CPU (Central Processing Unit) **121** as an arithmetic processing unit, a ROM (Read Only Memory) **122**, a RAM (Random Access Memory) **123**, and the like. The ROM **122** stores a program executed by the CPU **121**, a various kinds of fixed data, etc. The RAM **123** temporarily stores data necessary for executing a program. The controller **100** executes a recording operation (controlling the conveyance motor **125**, paper feeding motor **126**, head **2**, etc.) for recording an image, etc., on a paper P in accordance with a recording instruction from an external apparatus (such as a personal computer, etc.).

Further, the controller **100** executes inserting/removing operations for inserting/removing the hollow tube **65** with respect to the cartridge **30** accommodated in the cartridge accommodating section **61**. Specifically, the controller **100** executes the inserting operation for causing the hollow tube **65** to move from the first position to the second position, in a case that the cover **63** is switched from the open state to the close state in a state that the cartridge **30** is accommodated in the cartridge accommodating section **61**. In the inserting operation, the controller **100** drives the driving source **70** to rotate in the normal direction until the second switch **89** is switched from the OFF state to the ON state. On the other hand, the controller **100** executes the removing operation for causing the hollow tube **65** to move from the second position to the first position, in a case that the cover **63** is switched from the close state to the open state in the state that the cartridge **30** is accommodated in the cartridge accommodating section **61**. In the removing operation, the controller **100** drives the driving source **70** to rotate in the reverse direction until the first switch **88** is switched from the OFF state to the ON state.

Here, the inventor of the present teaching found out that, in an aspect for driving the driving source **70** at a constant driving speed in the above-described inserting operation as depicted in FIG. **7**A, the operation sound (sound generated by the mutually meshing gears **76***a* to **76***e*) generated from the driving force transmitting mechanism **75**, etc. is great at all times. A specified explanation will be given in the following. In the inserting operation for moving the hollow tube **65** from the first position to the second position, the force required for moving the hollow tube **65** by the unit distance is different among segments in the moving range of the hollow tube **65**. Specifically, the movement range between the first and second positions can be divided into four movement segments, in accordance with the force required for moving the hollow tube **65** by the unit distance. The four movement segments are: a movement segment (hereinafter referred to as "first movement segment") between the first position and a position at which the tip portion of the hollow tube **65** is brought into contact with the plug **41** of the first blocking member **40** (the position indicated by the chain lines of FIG. **3**A: hereinafter referred to as "first contact position"); a movement segment (hereinafter referred to as "second movement segment") between the first contact position and a release position at which the tip portion of the hollow tube **65** releases the plug **41**; a movement segment (hereinafter referred to as "third movement segment") between the release position and a position at which the tip portion of the hollow tube **65** is brought into contact with the valve body **52** of the second blocking member **50** (see FIG. **3**B: hereinafter referred to as "second contact position); and a movement segment (see FIG. **3**C: hereinafter referred to as "fourth movement segment") between the second contact position and the second position.

In the first movement segment, the hollow tube **65** does not make contact with the cartridge **30**, and thus the hollow tube **65** does not receive any resistance force from the cartridge **30** when the hollow tube **65** is being moved in this first movement segment. On the other hand, when the hollow tube **65** is being moved in the second to fourth movement segments, the hollow tube **65** makes contact with the cartridge **30**, and thus the hollow tube **65** receives the resistance force from the cartridge **30** when the hollow tube **65** is being moved in each of the second to fourth movement segments. Specifically, in the second movement segment, the hollow tube **65** receives resistance force generated when the hollow tube **65** penetrates through the plug **41** of the first blocking member **40**; in the third movement segment, the hollow tube **65** receives resistance force due to the friction force between the hollow tube **65** and the plug **41** when the hollow tube **65** passes through the plug **41**; and in the fourth movement segment, the hollow tube **65** receives the resistance force due to the friction force between the hollow tube **65** and the plug **41** and receives resistance force generated when the hollow tube **65** causes the valve body **52** of the second blocking member **50** to move against the urging force of the coil spring **53**. Note that as described briefly in the foregoing, the resistance force received by the hollow tube **65** from the first blocking member **40** when releasing the first blocking member **40** is greater than the resistance force received by the hollow tube **65** from the second blocking member **50** when releasing the second blocking member **50**. Therefore, the second movement segment is a movement segment in which the force required for moving the hollow tube **65** by the unit distance is greatest among the first to fourth movement segments. As described above, since the resistance forces received by the hollow tube **65** from the cartridge **30** are different among the first to fourth movement segments, the forces required for moving the hollow tube **65** by the unit distance are consequently different among the first to fourth movement segments.

Here, in a case of driving the driving source **70** at a constant driving speed during the inserting operation, the driving speed is needed to be set to a high driving speed (hereinafter referred to as "second driving speed") corresponding to the second movement segment, as depicted in FIG. **7**A. Therefore, during a period of time in which the hollow tube **65** is moved from the first position to the second position, the driving source **70** is consequently driven at the high, second driving speed, which in turn makes the operation sound from the driving force transmitting mechanism **75** be great at all times. In view of this situation, the present embodiment is configured such that when the controller **100** is executing the inserting operation, the controller **100** judges which movement segment, among the movement segments, the hollow tube **65** is moving in, and changes the driving speed at which the driving source **70** is driven depending on the movement segment in which the hollow tube **65** is currently moving, rather than driving the driving source **70** at any constant driving speed during the inserting operation.

Here, in the embodiment, the third movement segment has a distance which is not more than the thickness in the sub scanning direction of the O-ring **51** of the second blocking member **50**, and is quite short as compared with the remaining three movement segments. Namely, the timing at which the hollow tube **65** reaches the releasing position and the timing at which the hollow tube **65** reaches the second contact position are substantially coincident or same. Thus, in the embodiment, a movement segment obtained by merging the second and third movement segments is referred to as a "merged movement segment". Further, in the inserting operation, the controller **100** is configured to judge which movement segment, among the three movement segments that are the first, merged and fourth movement segments, the hollow tube **65** is moving in, and to drive the driving source **70** at one of pre-set driving speeds which have been previously set for the movement segments, respectively.

Next, an explanation will be given about the driving speeds of the driving source **70** which are set for the first, merged and fourth movement segments, respectively, with reference to FIG. **7**B. The driving speed for driving the driving source **70** in the merged movement segment, which includes the second movement segment in which the force required for moving the hollow tube **65** by the unit distance is the greatest, is set to be the above-described second driving speed. Furthermore, the force required for moving the hollow tube **65** by the unit distance in the fourth movement segment is smaller than the force required for moving the hollow tube **65** by the unit distance in the second movement segment. Accordingly, the driving speed for driving the driving source **70** in the fourth movement segment is set to be a third driving speed which is slower than the second driving speed. Moreover, the first movement segment is a segment in which the force required for moving the hollow tube **65** by the unit distance is the smallest among all the movement segments. Accordingly, the driving speed for driving the driving source **70** in the first movement segment is set to be a first driving speed which is slower than the second and third driving speeds.

In the inserting operation, the controller **100** of the embodiment makes the judgment as to whether the hollow tube **65** has reached the first contact position that is the boundary between the first movement segment and the merged movement segment, based on an elapsed time elapsed since the hollow tube **65** has been moved from the first position (since a movement start time: a point of time at which the first switch **88** has switched from the ON state to the OFF state). Specifically, the controller **100** judges that the hollow tube **65** has reached the first contact point at a point of time at which an external movement time (first time or first period of time) has elapsed since the point of time at which the hollow tube **65** started to move from the first position. Note that the term "external movement time" means a time obtained by dividing a control target distance (distance to be controlled) between the first position and the first contact position by a movement speed at which the hollow tube **65** is moved under a condition that the driving source **70** is driven at the first driving speed.

Note that there is any variation or dispersion of first positions and/or first contact positions due to manufacturing errors of the cartridge accommodating apparatuses **60** (printers **101**). Similarly, there is any variation of first contact positions due to manufacturing errors of the cartridges **30**. As a result, there is any variation of actual distances between the first positions and the first contact positions. Therefore, there is such a possibility that any big or significant difference might be generated between the control target distance between the first position and the first contact position and the actual distance between the first position and the first contact position. Namely, there is such a possibility that any big or significant difference in time might be generated between the time at which the external movement time has elapsed since the movement start time and a time (actual reach time) at which the hollow tube **65** actually reaches the first contact position. Considering this possibility, in the present embodiment, variation (maximum range of dispersion) of the first contact positions presumed at the time of manufacturing the cartridges **30** (hereinafter referred to as "cartridge-side variation") is stored in advance in the memory **141** (an example of the cartridge-side memory) of the cartridge **30**. Further, variation (maximum range of dispersion) of the first positions and variation (maximum range of dispersion) of the first contact positions, respectively, presumed at the time of manufacturing the cartridge accommodating apparatuses **60** (hereinafter referred to as "apparatus-side variation(s)") and a designed distance between the first position and the first contact position are stored in advance in the RAM **123** (an example of the cartridge accommodating apparatus-side memory) of the controller **100**. Then, in a case that the cartridge **30** is accommodated in the cartridge accommodating section **61**, the controller **100** reads the cartridge-side maximum variation stored in the memory **141** via the contact points **91** and **161**. The controller **100** determines the above-described control target distance between the first position and the first contact position based on the cartridge-side maximum variation read as described above and based on the apparatus-side maximum variations and the designed distance stored in the RAM **123**. Further, the controller **100** calculates the external movement time based on the determined control target distance and the above-described movement speed of the hollow tube **65**. By doing so, it is possible to make any time difference between the elapsed time elapsed since the movement start time and the time (actual reach time) at which the hollow tube **65** actually reaches the first contact position be small. Note that the calculated external movement time is stored in the RAM **123**.

Further, in the inserting operation, the controller **100** of the embodiment judges whether or not the hollow tube **65** has reached the second contact position (release position) that is the boundary between the merged movement segment and the fourth movement segment, based on a signal received from the magnetic detection sensor **66**. As briefly described above, the voltage value indicated by the signal received from the magnetic detection sensor **66** becomes lower as the valve body **52** is separated away from the O-ring **51** and moves leftward in FIGS. **3**A to **3**C. Namely, the voltage value indicated by the signal received from the magnetic detection sensor **66** changes after the hollow tube **65** has reached the second contact position and has been brought into contact with the valve body **52**. Thus, the controller **100** judges that the hollow tube **65** has reached the second contact position, under a condition that the signal received from the magnetic detection sensor **66** has changed from a signal indicating the maximum voltage value to a signal indicating a voltage value which is lower than the maximum voltage value by a predetermined voltage (hereinafter referred to as "judgement voltage value").

Further, the inventor of the present teaching found out that also regarding the removing operation for causing the hollow tube **65** to move from the second position to the first position, the operating sound from the driving force transmitting mechanism **75**, etc. is always loud at all times, in a case that the driving source **70** is driven at a constant driving speed, similarly with the inserting operation. Specifically, also in the removing operation, the movement range between the first position and the second position can be divided into four

movement segments that are the first to fourth movement segments, depending on the magnitude of force required for moving the hollow tube **65** by the unit distance. Here, in the embodiment, the difference in the resistance force, which is received by the hollow tube **65** from the cartridge **30**, among the second to fourth movement segments in the removing operation is smaller than the difference in the resistance force among the second to fourth movement segments in the inserting operation. Thus, as depicted in FIG. **7**C, in a case that the controller **100** judges that the hollow tube **65** is moving through any movement segment among the second to fourth movement segments, the controller **100** drives the driving source **70** at a fourth driving speed, whereas in a case that the controller **100** judges that the hollow tube **65** is moving through the first movement segment, the controller **100** drives the driving source **70** at a fifth driving speed which is slower than the fourth driving speed. In the embodiment, the fourth driving speed is set to be slower than the second driving speed, and the fifth driving speed is set to be the same as the first driving speed.

Note that in the removing operation, regarding the judgement as to whether or not the hollow tube **65** is located to be closer to the side of the first position than the first contact position that is the boundary between the first movement segment and the merged movement segment (whether or not the hollow tube **65** is separated away from the plug **41**), the controller **100** judges that the hollow tube **65** is separated away from the plug **41** at a point of time when a plug pass-through time has elapsed since a point of time at which the voltage value of the signal received from the magnetic detection sensor **66** has changed to the maximum voltage value. Note that the term "plug pass-through time" means a time obtained by dividing a control target distance between the first and second contact positions by a movement speed at which the hollow tube **65** is moved under a condition that the driving source **70** is driven at the fourth driving speed. The plug pass-through time is stored in advance in the RAM **123**.

Next, an explanation will be given about an example of an operation performed by the printer **101** in a case that the controller **100** judges that the cover **63** is switched from the ON state to the OFF state based on the signal from the open/close sensor **170**, with reference to FIGS. **8**A and **8**B. At first, the controller **100** judges whether or not the second switch **89** is in the ON state (S**1**). In a case that the controller **100** judges that the second switch **89** is in the ON state (S**1**:YES), then the controller **100** judges that the hollow tube **65** is arranged at the second position and that there is no need to perform the inserting operation, and ends this operation. On the other hand, in a case that the controller **100** judges that the second switch **89** is in the OFF state (S**1**: NO), the controller **100** judges that the inserting operation needs to be executed, and judges whether or not the first switch **88** is in the ON state (S**2**). In a case that the controller **100** judges that the first switch **88** is in the ON state (S**2**: YES), the controller **100** judges that a new cartridge **30** is accommodated in the cartridge accommodating section **61**, reads the cartridge-side maximum variation from the memory **141** of the new cartridge **30** (S**3**). Then, the controller **100** determines a control target distance between the first position and the first contact position based on the cartridge-side maximum variation read from the memory **141** and the apparatus-side maximum variation and the designed distance stored in the RAM **123**. Further, the controller **100** calculates the external movement time by using the control target distance and stores the calculated external movement time in the RAM **123** (S**4**). When the processing in Step S**4** is finished, the controller **100** then moves onto a processing in Step S**6**.

On the other hand, in a case that the controller **100** judges that the first switch **88** is in the OFF state (S**2**: NO), the hollow tube **65** is arranged between the first and second positions. Therefore, the controller **100** executes a first position movement processing for moving the hollow tube **65** to the first position (S**5**). Specifically, the controller **100** drives the driving source **70** to rotate in the reverse direction until the first switch **88** is switched from the OFF state to the ON state. By doing so, even in such a case that the controller **100** cannot grasp the position of the hollow tube **65**, for example, after the operation of the printer **101** has been stopped due to any occurrence of abnormality, etc., it is possible to grasp the position of the hollow tube **65** by returning the hollow tube **65** to the first position. When the processing in Step S**5** is finished, the controller **100** then moves onto the processing in Step S**6**.

In the processing in Step S**6**, the controller **100** drives the driving source **70** to rotate in the normal direction at the first driving speed, so as to start the movement of the hollow tube **65** from the first position toward the second position. Next, the controller **100** judges whether or not the external movement time stored in the RAM **123** has elapsed since the time of movement of the hollow tube **65** from the first position (S**7**). In a case that the controller **100** judges that the external movement time has not elapsed (S**7**: NO), the controller **100** judges that the hollow tube **65** has not reached the first contact position, and repeats the processing in Step S**7**. On the other hand, in a case that the controller **100** judges that the external movement time has elapsed (S**7**: YES), then the controller **100** judges that the hollow tube **65** has reached the first contact position, and switches the driving speed of the driving source **70** from the first driving speed to the second driving speed (S**8**). Next, the controller **100** judges whether or not the signal received from the magnetic detection sensor **66** has changed from the signal indicating the maximum voltage value to a signal indicating the judgment voltage value (S**9**). In a case that the controller **100** judges that the signal received from the magnetic detection sensor **66** has not changed to the signal indicating the judgement voltage value (S**9**: NO), the controller **100** judges that the hollow tube **65** has not reached the second contact position (release position), and repeats the processing in Step S**9**.

On the other hand, in a case that the controller **100** judges that the signal received from the magnetic detection sensor **66** has changed to the signal indicating the judgement voltage value (S**9**: YES), the controller **100** judges that the hollow tube **65** has reached the second contact position, and switches the driving speed of the driving source **70** from the second driving speed to the third driving speed (S**10**). Next, the controller **100** judges whether or not the second switch **89** has switched from the OFF state to the ON state (S**11**). In a case that the controller **100** judges that the second switch **89** is in the OFF state (S**11**: NO), the controller **100** judges that the hollow tube **65** has not reached the second position, and repeats the processing in Step S**11**. On the other hand, in a case that the controller **100** judges that the second switch **89** has switched to the ON state (S**11**: YES), the controller **100** judges that the hollow tube **65** has reached the second position, stops the driving of the driving source **70** (S**12**), and ends the operation.

Next, an explanation will be given about an example of an operation performed by the printer **101** in a case that the controller **100** judges that the cover **63** is switched from the close state to the open state based on the signal from the open/close sensor **170**, with reference to FIGS. **9**A and **9**B. At first, the controller **100** judges whether or not the first switch **88** is in the ON state (D**1**). In a case that the controller **100**

judges that the first switch **88** is in the ON state (D**1**: YES), then the controller **100** judges that there is no need to perform the removing operation, and ends the operation. On the other hand, in a case that the controller **100** judges that the first switch **88** is in the OFF state (D**1**: NO), the controller **100** judges that the removing operation needs to be executed, and judges whether or not the signal received from the magnetic detection sensor **66** is the signal indicating the maximum voltage value (D**2**). In a case that the controller **100** judges that the signal received from the magnetic detection sensor **66** is not the signal indicating the maximum voltage value (D**2**: NO), the controller **100** judges that the hollow tube **65** is arranged at the second position, or at a position between the second position and the second contact position, and the controller **100** drives the driving source **70** to rotate in the reverse direction at the fourth driving speed to thereby move the hollow tube **65** toward the first position (D**3**). Next, the controller **100** judges whether or not the signal received from the magnetic detection sensor **66** has changed to the signal indicating the maximum voltage value (D**4**). Then, in a case that the controller **100** judges that the signal received from the magnetic detection sensor **66** has changed to the signal indicating the maximum voltage value (D**4**: YES), the controller **100** judges that the hollow tube **65** has moved to the second contact position, sets the time at which this judgement has been made (judgement time) to a clocking start time, and moves on to a processing in Step D**6**.

On the other hand, in a case that the controller **100** judges that the signal received from the magnetic detection sensor **66** is the signal indicating the maximum voltage value (D**2**: YES), the controller **100** judges that the hollow tube **65** is arranged between the first position and the second contact position. Here, in the embodiment, also in such a case that the controller **100** cannot specify the position of the hollow tube **65**, the controller **100** drives the driving source **70** to rotate in the reverse direction at the fourth driving speed so as to move the hollow tube **65** toward the first position (D**5**). Namely, unlike the inserting operation, the controller **100** does not perform the processing for specifying the position of the hollow tube **65** by moving the hollow tube **65** to the second position. Further, in this situation, the controller **100** sets the time at which the driving of the driving source **70** has started, as the clocking start time. When this processing is finished, the controller **100** moves on to the processing in Step D**6**.

In the processing in Step D**6**, the controller **100** judges whether or not the plug pass-through time stored in the RAM **123** has elapsed since the clocking start time set in the processing in Step D**4** or D**5**. In a case that the controller **100** judges that the plug pass-through time has elapsed (D**6**: YES), the controller **100** judges that the tip portion of the hollow tube **65** is separated away from the plug **41**, and the controller **100** switches the driving speed of the driving source **70** from the fourth driving speed to the fifth driving speed (D**7**). Next, the controller **100** judges whether or not the first switch **88** has switched from the OFF state to the ON state (D**8**). In a case that the controller **100** judges that the first switch **88** is in the OFF state (D**8**: NO), the controller **100** repeats the processing in Step D**8**; on the other hand, in a case that the controller **100** judges that the first switch **88** has switched from the OFF state to the ON state (D**8**: YES), the controller **100** judges that the hollow tube **65** is arranged at the first position, and the controller **100** stops driving the driving source **70** (D**9**), and ends the operation.

On the other hand, in a case that the controller **100** judges in the processing of D**6** that the plug pass-through time has not elapsed (D**6**: NO), the controller **100** judges whether or not the first switch **88** has switched from the OFF state to the ON state (D**10**). In a case that the controller **100** judges that the first switch **88** is in the OFF state (D**10**: NO), the controller **100** judges that the hollow tube **65** is still arranged between the first and second positions, and returns to the processing in Step D**6**. On the other hand, in a case that the controller **100** judges that the first switch **88** has switched from the OFF state to the ON state (D**10**: YES), the controller **100** judges that the hollow tube **65** is arranged at the first position, stops driving the driving source **70** (D**9**), and ends this operation.

As described above, in each of the cases that the controller **100** of the embodiment judges, in the inserting operation, that the hollow tube **65** is moving in the first movement segment and the fourth movement segment, the controller **100** drives the driving source **70** at the driving speed slower than the second driving speed at which the driving source **70** is driven in the merged movement segment. By doing so, it is possible to make the operation sound generated from the driving force transmitting mechanism **75** be small during a period of time in which the hollow tube **65** is moving in each of the first movement segment and the fourth movement segment. Further, in a case that the controller **100** judges, in the removing operation, that the hollow tube **65** is moving in the first movement segment, the controller **100** drives the driving source **70** at the driving speed slower than the fourth driving speed at which the driving source is driven in each of the second to fourth movement segments. By doing so, it is possible to make the operation sound generated from the driving force transmitting mechanism **75** be small during a period of time in which the hollow tube **65** is moving in the first movement segment. Furthermore, the controller **100** of the embodiment determines the control target distance in view of the cartridge-side maximum variation of the first contact position and the apparatus-side maximum variation of each of the first position and the first contact position, and the controller **100** calculates the exterior movement time by using the control target distance. By doing so, it is possible to make the difference in time be small between the time at which the exterior movement time has elapsed since the movement start time and the actual time (actual reach time) at which the hollow tube **65** actually reaches the first contact position. As a result, the driving source **70** can be driven at the driving speed depending on (in conformity with) the movement segment in which the hollow tube **65** is actually moving. Moreover, the controller **100** of the embodiment judges whether or not the hollow tube **65** has reached the second contact position (release position), based on the signal received from the magnetic detection sensor **66** configured to detect the intensity of the magnetic field which changes depending on the distance between the magnetic detection sensor **66** and the valve body **52** of the second blocking member **50**. Thus, the controller **100** is capable of judging in an assured manner that the hollow tube **65** has reached the second contact position (release position).

In the foregoing, the suitable embodiment of the present teaching has been explained. The present teaching, however, is not limited to the above-described embodiment, and it is possible to make any appropriate changes in the embodiment of the present teaching within the range of the description in the following claims. In the following, an explanation will be given about a cartridge accommodating apparatus configured to accommodate another cartridge, with reference to FIGS. **10**A to **10**C. The another cartridge has a substantially same configuration as that of the cartridge **30**, except for having first and second blocking members **240** and **250** which are different from the first and second blocking members **40** and **50** of the cartridge **30**, and the remaining parts or components, of the another cartridge, other than the first and second block-

ing members **240** and **250** are substantially same as those of the cartridge **30**. The first blocking member **240** has a plug **241**, a spherical body **242** and a coil spring **243**. The plug **241** is provided to block or close an opening in the other end of a tube **35**, similarly to the above-described plug **41**, and the plug **241** has a slit **241***a* penetrating through a central portion of the plug **241** in the sub scanning direction. In a case that the first blocking member **240** is in the close state as depicted in FIG. **10**A, the spherical body **242** is brought into tight contact with the plug **241** so as to block the slit **241***a* with the spherical body **242**, thereby blocking (cutting off) the communication between the ink channel **33***a* and the outside of the ink channel **33***a*. The coil spring **243** has the base end which is fixed to an annular-shaped projection **34***c*, and the forward end (distal end) which makes contact with the spherical body **242**, thereby urging the spherical body **242** toward the plug **241** at all times.

The second blocking member **250** is arranged inside a tube **34**, and has an O-ring **251**, a valve body **252** and a coil spring **253**. Further, the valve body **252** has a stick-shaped pressing member **270** which is disposed in a central portion on a surface, of the valve body **252**, facing the first blocking member **240**, and which extends in the sub scanning direction. The pressing member **270** has the diameter that is smaller than the diameter of an opening defined by the annular-shaped projection **34***c*, and the pressing member **270** is inserted inside the opening defined by the annular-shaped projection **34***c*. Further, in a state that the hollow tube **65** does not reach the second contact position (see FIG. **10**C), the end portion of the pressing member **270** is separated away from the spherical body **242**. The O-ring **251** is fixed to a surface, of the annular-shaped projection **34**, on the side not facing the first blocking member **240**. The coil spring **253** has the base end fixed to a connecting section **32***a* of the ink bag **32** and the forward end (distal end) brought into contact with the valve body **252**, thereby urging the valve body **252** toward the O-ring **251** at all times. Accordingly, in a case that the second blocking member **250** is in the close state wherein the second blocking member **250** closes (blocks) the ink channel **33***a*, the valve body **252** makes contact with the O-ring **251**. With this, the communication is blocked between the space, in the ink channel **33***a*, from the one end of the tube **34** to the O-ring **251** and another space, in the ink channel **33***a*, from the O-ring **251** to the first blocking member **240**, which in turn blocks the communication between the ink bag **32** and the outside of the ink bag **32**, via the ink channel **33***a*.

Accompanying with the start of movement of the hollow tube **65** from the first position to the second position, at first, as depicted in FIG. **10**B, the hollow tube **65** is inserted into the slit **241***a*. Further, the hollow tube **65** moves the spherical body **242** in a state that the tip portion of the hollow tube **65** is brought into contact with the spherical body **242**, thereby separating the spherical body **242** away from the plug **241**. In this situation, the hollow tube **65** is arranged at the release position, which in turn switches the first blocking member **240** from the close state to the open state. Further, after the spherical body **242** has been separated away from the plug **241**, the spherical body **242** is brought into contact with the end portion of the pressing member **270** (see FIG. **10**C). Furthermore, when the hollow tube **65** advances (enters) farther into the ink channel **33***a*, the pushing member **270** is moved, which in turn causes the valve body **252** to separate away from the O-ring **251**. In this situation, the second blocking member **250** is switched from the close state to the open state.

Note that in this aspect, the phrase that "the tip portion of the hollow tube **65** is brought into contact (makes contact) with the second blocking member **250**" corresponds to a situation or state that the hollow tube **65** is brought into contact (makes contact) with the end portion of the pressing member **270** via the spherical body **242**. Further, in the embodiment, the resistance force received by the hollow tube **65** from the first blocking member **240** when the hollow tube **65** releases (opens) the first blocking member **240** is smaller than the resistance force received by the hollow tube **65** from the second blocking member **250** when the hollow tube **65** releases the second blocking member **250**. Accordingly, the third driving speed of the driving source **70** corresponding to the fourth movement segment between the second contact position and the second position is set to be faster than the second driving speed of the driving source **70** corresponding to the second movement segment. Further, in this aspect, the third movement segment is a distance same as the spacing distance (clearance) between the pressing member **270** and the spherical body **242**, and is longer than that in the above-described embodiment. Accordingly, the controller **100** is configured to further judge whether or not the hollow tube **65** is moving in the third movement segment. Further, in a case that the controller **100** judges that the hollow tube **65** is moving in the third movement segment, the controller **100** may drive the driving source **70** at a driving speed slower than the second driving speed.

In the following, other modifications will be explained. In the above-described embodiment, the controller **100** judges, in the inserting operation, whether or not the hollow tube **65** has reached the first contact position, based on the elapsed time elapsed since a point of time at which the hollow tube **65** has been moved from the first position. The present teaching, however, is not limited particularly to this. For example, the controller **100** is allowed to make the judgement based on the pulse count of the driving motor as the driving source **70**. Further, in the embodiment, the controller **100** judges, in the inserting operation, whether or not the hollow tube **65** has reached the release position (second contact position) by detecting, with the magnetic detection sensor **66**, the strength of the magnetic field which changes as the hollow tube **65** is moved from the release position toward the second position. The present teaching, however, is not limited particularly to this. For example, it is also allowable to provide a sensor configured to detect whether or not the hollow tube **65** is arranged at the release position (for example, a transmission-type sensor, a sensor of the mechanical switch type, etc.), and the controller **100** is allowed to make the judgement based on a result of detection by this sensor. Furthermore, the controller is allowed to make judgment as to whether or not the hollow tube **65** has reached the release position (second contact position), based on an elapsed time elapsed since a point of time at which the controller **100** has judged that the hollow tube **65** has reached the first contact position. Specifically, it is allowable that the controller **100** judges that the hollow tube **65** has reached the release position at a point of time at which the plug pass-through time (second time; second period of time) has elapsed since a point of time at which the controller **100** has judged that the hollow tube **65** has reached the first contact position. Note that the plug pass-through time is a time obtained by dividing a control target distance between the first contact position and the release position by a movement speed of the hollow tube **65** under a condition that the driving source **70** is driven at the second driving speed. Moreover, although the moving member as the target detection member for the magnetic detection sensor **66** is the valve body **52** of the second blocking member **50**, the present teaching is not limited particularly to this. It is allowable that the moving body as the target detection member is a member,

part or component which is different from any constituent part or component of the second blocking member **50**. Furthermore, although the embodiment is configured such that the exterior movement time is calculated under a condition that a new cartridge **30** is accommodated in the cartridge accommodating section **60** and then the calculated exterior movement time is stored in the RAM **123**, it is also allowable that an assumed exterior movement time is stored in advance in the RAM **123**.

Further, in the embodiment, although the explanation has been given about the cartridge wherein the resistance force received by the hollow tube **65** from the first blocking member **40** when the hollow tube **65** releases the first blocking member **40** is different from the resistance force received by the hollow tube **65** from the second blocking member **50** when the hollow tube **65** releases the second blocking member **50**, it is allowable to provide a cartridge wherein these resistance forces are same with each other. In such a case, the second driving speed corresponding to the second movement segment is same as the third driving speed corresponding to the fourth movement segment. Furthermore, although the embodiment is configured such that, in the removing operation, the driving speeds corresponding to the second to fourth movement segments, respectively, are set to be mutually same, it is allowable to set the moving speeds to be different among the second to fourth segments, depending on the force required for moving the hollow tube **65** by the unit distance for each of the second to fourth movement segments. Moreover, in the embodiment, since the through hole is already formed in the plug **41** in a case that the inserting operation is to be executed for the second time for the same cartridge **30**, the driving speed in the merged movement segment (second movement segment) may be slower than the driving speed in the merged movement segment (second movement segment) adopted when the inserting operation was executed for the first time.

Moreover, in the embodiment, although the driving force transmitting mechanism is constructed of the gears **76***a* to **76***e*, the driving force transmitting mechanism is not particularly limited to the above configuration, provided that the driving force of the driving source can be transmitted to the moving mechanism. For example, the driving force transmitting mechanism may be configured such that the first gear is directly meshed with the second gear, or such that the driving force is transmitted via a belt.

The liquid to be stored or accommodated in the cartridge is not limited to an ink. For example, the liquid may be an image quality-improving liquid, etc., which is applied to (coated on) a recording paper P before performing printing thereon, for the purpose of improving the image quality. The cartridge accommodating apparatus according to the present teaching is not limited to a printer, and the present teaching may be applied to a facsimile machine, a copying machine, etc.

What is claimed is:

1. A cartridge accommodating apparatus comprising:

a cartridge accommodating section configured to accommodate a cartridge which includes a liquid accommodating section configured to accommodate liquid, a liquid lead-out channel communicated with the liquid accommodating section and configured to lead the liquid to outside of the liquid accommodating section, a first blocking member configured to block a first portion of the liquid lead-out channel, and a second blocking member configured to block a second portion, of the liquid lead-out channel, between the first portion of the liquid lead-out channel and the liquid accommodating section;

a hollow tube configured to introduce the liquid, in the liquid lead-out channel of the cartridge, into inside of the hollow tube;

a moving mechanism configured to move the hollow tube between a first position at which a tip portion of the hollow tube is located outside the liquid lead-out channel of the cartridge accommodated in the cartridge accommodating section and a second position at which the tip portion of the hollow tube has entered inside the liquid lead-out channel of the cartridge and the hollow tube is communicated with the liquid accommodating section of the cartridge;

a driving source;

a driving force transmitting mechanism configured to transmit driving force of the driving source to the moving mechanism; and

a driving source controller configured to control driving speed of the driving source,

wherein the driving source controller is configured to:

drive the driving source at a first driving speed, after causing the hollow tube to move from the first position and until judging that the tip portion of the hollow tube has reached a first contact position at which the tip portion of the hollow tube makes contact with the first blocking member;

drive the driving source at a second driving speed which is faster than the first driving speed, after judging that the tip portion of the hollow tube has reached the first contact position and until judging that the tip portion of the hollow tube has reached a release position at which the tip portion of the hollow tube releases the first blocking member; and

drive the driving source at a third speed, after judging that the tip portion of the hollow tube has reached a second contact position at which the tip portion of the hollow tube makes contact with the second blocking member.

2. The cartridge accommodating apparatus according to claim **1**,

wherein the third driving speed is faster than the first and second driving speeds, in a case that resistance force received by the hollow tube from the second blocking member under a condition that the hollow tube releases the second blocking member is greater than resistance force received by the hollow tube from the first blocking member under a condition that the hollow tube releases the first blocking member, and

the third driving speed is faster than the first driving speed and is slower than the second driving speed, in a case that the resistance force received by the hollow tube from the second blocking member under the condition that the hollow tube releases the second blocking member is smaller than the resistance force received by the hollow tube from the first blocking member under the condition that the hollow tube releases the first blocking member.

3. The cartridge accommodating apparatus according to claim **1**,

wherein the driving source is a driving motor having a rotation shaft,

the driving force transmitting mechanism has a first gear connected to the rotation shaft of the driving motor, and a second gear meshed with the first gear directly or indirectly, and

the moving mechanism is provided with a converting mechanism configured to convert a rotation operation of the second gear to a moving operation for moving the hollow tube between the first and second positions.

4. The cartridge accommodating apparatus according to claim 1, wherein in a case that the driving source controller causes the hollow tube to move from the second position to the first position, the driving source controller is configured to:

drive the driving source at a fourth driving speed, in a case of judging that the tip portion of the hollow tube is not separated away from the first blocking member; and

drive the driving source at a fifth driving speed which is slower than the fourth driving speed, in a case of judging that the tip portion of the hollow tube is separated away from the first blocking member.

5. The cartridge accommodating apparatus according to claim 1, wherein the driving source controller is configured to judge that the hollow tube has reached the first contact position at a point of time at which a first time has elapsed since the driving source has been driven and the hollow tube has been moved from the first position, and

the first time is determined based on a first control target distance between the first position and the first contact position and a moving speed at which the hollow tube is moved under a condition that the driving source is driven at the first driving speed.

6. The cartridge accommodating apparatus according to claim 5, wherein the first control target distance is determined based on a designed distance between the first position and the first contact position, variation of the first position presumed at the time of manufacturing the cartridge accommodating apparatus, variation of the first contact position presumed at the time of manufacturing the cartridge, and variation of the first contact position presumed at the time of manufacturing the cartridge accommodating apparatus.

7. The cartridge accommodating apparatus according to claim 5, further comprising a cartridge accommodating apparatus-side memory,

wherein the cartridge further includes a cartridge-side memory configured to store variation of the first contact position presumed at the time of manufacturing the cartridge,

the driving source controller is configured to:

read the variation of the first contact position stored in the cartridge-side memory;

store, in the cartridge accommodating apparatus-side memory, a designed distance between the first position and the first contact position, variation of the first position presumed at the time of manufacturing the cartridge accommodating apparatus, and variation of the first contact position presumed at the time of manufacturing the cartridge accommodating apparatus;

determine the first control target distance based on the variation of the first contact position read from the cartridge-side memory, and based on the designed distance, the variation of the first position and the variation of the first contact position which are stored in the cartridge accommodating apparatus-side memory; and

calculate the first time based on the first control target distance and the moving speed at which the hollow tube is moved under a condition that the driving source is driven at the first driving speed.

8. The cartridge accommodating apparatus according to claim 1,

wherein the driving source controller is configured to judge that the hollow tube has reached the release position at a point of time at which a second time has elapsed since a point of time at which the controller has judged that the hollow tube has reached the first contact position, and

the second time is determined based on a second control target distance between the first contact position and the release position and a moving speed at which the hollow tube is moved under a condition that the driving source is driven at the second driving speed.

9. The cartridge accommodating apparatus according to claim 1,

wherein the cartridge is further provided with a sensor configured to detect whether or not the hollow tube is arranged at the release position, or configured to detect an information which changes as the hollow tube is moved from the release position toward the second position, and

the driving source controller is further configured to:

receive a result of detection executed by the sensor; and

judge whether or not the hollow tube has reached the release position based on the received result of the detection executed by the sensor.

10. The cartridge accommodating apparatus according to claim 9,

wherein the cartridge further includes a movable body which is formed of a magnetic material, which is disposed to be movable in a predetermined range between the first portion inside the liquid lead-out channel and the liquid accommodating section, and which is configured to move by being pushed by the hollow tube at least during a partial period included in a period during which the hollow tube is moved from the release position to the second position, and

the sensor is a magnetic detection sensor configured to detect a magnetic field which changes as the movable body moves inside the liquid lead-out channel.

11. The cartridge accommodating apparatus according to claim 10,

wherein resistance force received by the hollow tube from the second blocking member when the hollow tube releases the second blocking member is smaller than resistance force received by the hollow tube from the first blocking member when the hollow tube releases the first blocking member,

the second blocking member is a valve member including:

a valve body constructed of the movable member;

an urging member configured to urge the valve body toward a lead-out port of the liquid lead-out channel; and

a valve seat having an opening, which is blocked under a condition that the valve body is brought into contact with the opening and which is released under a condition that the valve body is separated away from the opening, and

the driving source controller is configured to judge whether or not the hollow tube has reached the second contact position based on a result of detection executed by the magnetic detection sensor.

12. The cartridge accommodating apparatus according to claim 10, wherein the driving source controller is configured to judge that the hollow tube has reached the release position at a point of time at which an amount of change of the magnetic field, detected by the magnetic detection sensor since a point of time at which the driving source controller has judged that the hollow tube has reached the first contact position, becomes not less than a predetermined amount.

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